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REPORT

TO THE

LORDS OF THE COMMITTEE OF PRIVY COUNCIL FOR TRADE AND FOREIGN PLANTATIONS,

ON THE

RAILWAYS OF THE UNITED STATES.

BY

CAPTAIN DOUGLAS GALTON, R.E.

Presented to both Houses of Parliament by Command of Her Majesty.

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PRINTED BY GEORGE EDWARD EYRE AND WILLIAM SPOTTISWOODE,
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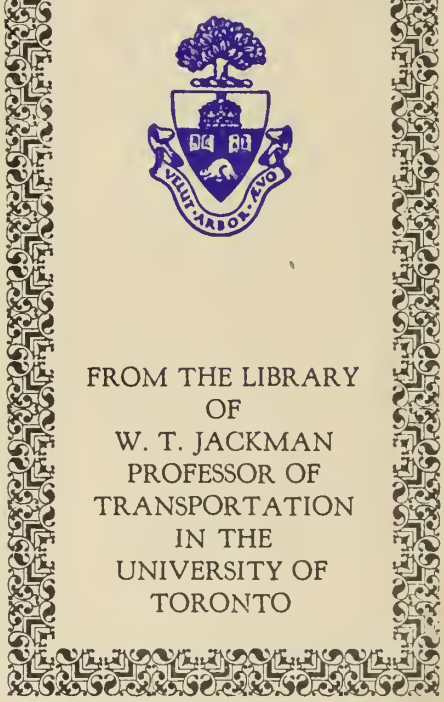

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ON

THE RAILWAYS OF THE UNITED STATES,

BY

CAPTAIN DOUGLAS GALTON, R.E.

Railway Department, Board of Trade, Whitehall,
8th December 1856.

My Lords,

In the course of a rapid journey which I made through the United States during the last autumn, I took every opportunity of observing the railway system of that country; and as it presents many points of interest connected more especially with the extension of railways in new countries, I have thought it desirable to lay before your Lordships the following short summary of the information which I gathered.

Outline of the Railway System of the United States.

The European communities at the period of the introduction of railways possessed a fixed population, fair means of internal communication, and a considerable trade, so that the elements existed for calculating beforehand the probable amount of traffic which a railway would obtain, and the probable profit to be realized; a large amount of capital was also available for their construction; and when first opened for traffic, European railways were placed in a tolerably complete state.

In America the conditions were quite different. There were, indeed, large cities situated on the sea coast, or inland on the rivers, which formed the chief highways, but the rest of the country was either sparsely settled, or uninhabited except by Indians; the means of communication were indifferent, and trade was consequently undeveloped; but the immigration which was continually flowing westward required extensive facilities for transport.

Capital was, however, scarce; and as in a new country it is impossible to foresee at the opening of a railway where the main centres of traffic will eventually be, it would have been a mere waste to invest more capital in the construction of a railway than would render it efficient for the work immediately before it; a further expenditure being incurred as the requirements of the traffic became gradually apparent.

It is also to be borne in mind that a railroad causes the absorption, not only of the capital actually required for its construction, but, of a very much larger amount, for developing the resources of the country through which it passes. This is very apparent at the present time on the prairies; there the fertile loam, of which they are composed, is unsuited to the construction of a common road; but railways are laid easily and cheaply, and their establishment is immediately followed by the settlement of the country. The Illinois Central Railway is an instance of this. When first opened three years ago, the station-houses were almost the only habitations on the line; now there is a large village at each station, surrounded by vast tracts of cultivated ground. When I passed along the line last autumn, sacks of corn covered every available spot round the stations, and the means of the company were scarcely adequate for removing them.

The different circumstances under which railways are constructed, and the different instrument required, in a new as compared with an old country, would render it almost impossible to form any fair comparison between the relative

cost of railways in Europe and in the United States, even if there were any reliable summary of the cost of American railways: but none exists.* The only states in which detailed collated information on railways is published are New York and Massachusetts.

The cost of lines in these two States would appear to have averaged 11,390*l.* per mile; and in the last report of the census the average cost of the railways throughout the United States, at the end of 1851, was stated to be about 7,000*l.* per mile.

From the complete and valuable report of the Railroad Commissioners of New York, it appears that there are about 26,000 miles of railway in operation at the present time in the United States, of which not much more than one-sixth is double line. The greater part of these railways have been constructed by means of Irish labour.

The railways of the United States appear to have been designed principally with the view of connecting the sea coast with the fertile lands in the west; but the range of the Alleghany Mountains rising in the north near Lake Ontario, and running nearly parallel to the coast, intersects every line of travel between the important commercial sea-board cities and the western districts.

The direct eastern and western traffic which traverses this range passes over four principal railway routes, viz.:—

1st. The New York Central Railway, which is a link in the communication from Boston to the West; this is connected with New York by the Hudson River Railroad, and is connected with western lines at Niagara and Buffalo. This line passes up the valley of the Mohawk, and has favourable gradients along its whole length.

2nd. The New York and Erie Railway, which, crossing the Alleghany Mountains near the head waters of the Susquehanna and Delaware, forms a connexion with western lines at Niagara and along the south shore of Lake Erie.

3rd. The Pennsylvania Central Railway, which runs from Philadelphia to Pittsburg, and there forms a connexion with the railways crossing the centre of Ohio.

4th. The Baltimore and Ohio Railway, from Baltimore to Wheeling, and thence to Columbus and Cincinnati.

It is not probable that, for the present, any other line will be carried across the Alleghany mountains, at least to the north of Baltimore. Hence the development of the Western States, and the projected railroads to the Pacific, will add to the important traffic which these several roads already possess.

To the south, roads are projected to run from Virginia, from Charleston, and from Savannah to the Mississippi.

In addition to these eastern and western routes of the United States must be mentioned the communication by water along the lakes, a communication which is continued by the Erie Canal to New York, and by the St. Lawrence through Canada to the Atlantic; and the line of Canadian Railways, which since the opening of the Grand Trunk Railway has assumed considerable importance. This line commences with the Great Western of Canada at Detroit, and, passing through Toronto, is continued by the Grand Trunk Railway, which, when the Victoria Bridge shall have been completed, will afford an uninterrupted line of railway communication through Montreal to Quebec, and to Portland in the State of Maine. But it cannot be considered that this line of communication is completed, or that a proper outlet has been afforded to the trade of the British North American possessions, until the line of railway through Canada shall have been continued on to Halifax.

The great question, however, of railway extension from east to west, which now occupies the attention of the American public, is the construction of a railway to connect the Eastern States with the Pacific Ocean. Five routes have been proposed, but the most practicable are limited to the three following lines, viz.—

1st. From St. Paul's to Vancouver, near the parallel of 48°.

2nd. From Council Bluffs to Benicia, which is near to San Francisco, viâ the south-west pass, near the parallel of 42°.

3rd. From Fulton to San Pedro, near the parallel of 32°.

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* The best information on every subject connected with Railways in the United States is found in the "American Railroad Journal," edited by Mr. S. V. Poor.

The following comparison of the routes is obtained from the Secretary of State's report to Congress on the subject, viz.:—

	Length.	Height of Summit Level or Passes.	Estimated Cost.	Proportion of Arable Land through which they pass.
	Miles.	*Feet.*		
1st.	1,864	6,044	£25,000,000	30 per cent.
2nd.	2,032	8,733	£23,000,000	35 „
3rd.	1,618	5,717	£17,000,000	45 „

The question of a means of communication across this continent is one which Great Britain should not leave to be solved by the United States alone.

It would be foreign to the object of this report to discuss this question, but it will not be superfluous to observe that the large American population which is flocking year after year to the new territories in the United States which adjoin the British possessions, render it almost necessary, if further complications on the subject of the boundary are to be avoided, that the country should be colonized on the British side. Political, commercial, and military considerations make it desirable that Vancouver's Island should become an important colony and be connected by railway with Canada. The land between Lake Superior and the Red River is known to be fertile, and it is probable that this fertility extends far beyond; hence a private company might be induced by grants of land to construct that portion of the railway which would lie between Lake Superior and some point a short distance to the east of the Rocky Mountains. The main difficulty lies at the Rocky Mountains. This portion would, however, afford a good opportunity for employing convict labour; and the construction of docks and other public works at Vancouver would enable this colony to be continued as a penal settlement for some years to come.

The principal north and south route, not including the railways along the eastern coast, is the Illinois Central Railway. This Railway runs from Cairo at the confluence of the Mississippi and Ohio rivers to Chicago and Dubuque; and from its termini lines are projected to run northwards to Superior City and southwards to Mobile on the Gulf of Mexico.

Chicago is the chief focus of railway communication in the west, and may be called the offspring of the railway system.

It is situated in one of the most fertile regions of the world at the southern extremity of Lake Michigan, on a perfectly flat plain at the edge of the prairies. At no great distance from it are rich mines of lead, iron, copper, and coal. It possesses communication by water with the Atlantic by means of the lakes, the St. Lawrence, and the Eric Canal, and with the Gulf of Mexico, by the Bridgeport Canal, and the Mississippi. It forms the mart for the interchange of the produce of the prairies with the lumber and other articles which require to be imported; and hence it is to the railways, by which that produce is developed, that its great progress has been due.* In 1832 the site of the present town was occupied by a small fort and a few log cabins. The first railway was completed in 1850, and the following figures will give some idea of the rapid increase of Chicago since since that period.

In 1849 the population was 23,047; in 1855 it was 83,509. In 1851 the number of miles of railway centering in Chicago were 40, and the annual receipts from traffic about 8,000*l.*; in 1855 the miles of railway centering in Chicago amounted to 2,933, and the receipts from traffic to 2,659,640*l.* In

* The progress of Chicago is due to the cultivation of the rich prairie land by which it is surrounded; but it has been much favoured by the reciprocity treaty between the United States and Canada. At the present time the land of the prairies is only cultivated at intervals along the lines of railway, but the area of the State of Illinois is 55,000 square miles, and it is stated upon good authority that 80 per cent. of the whole area—equal to 44,000 square miles or 28,260,000 acres—consists of first-class arable land, very similar to what is already in cultivation. It is stated that an average crop of wheat in Illinois is from 25 to 30 bushels per acre, and that frequently it reaches 40 bushels per acre. If one-fourth of the above-mentioned area were devoted to the culture of wheat, and if the annual average produce per acre be taken at 25 bushels, the yield would amount to nearly 180,000,000 of bushels annually. As the prairies are bare of timber no clearing is necessary, and the land need only be ploughed and sown to obtain a crop. The absence of timber, however, gives rise to an enormous demand for lumber, as the houses are almost invariably at first built of wood. The President of one of the principal railways told me that it is curious to observe how, in the first year or two after a railway is opened, the necessaries of life alone are transported along it, but how as time progresses luxuries, such as New York carriages and harness, handsome furniture, &c., are sent for by the settlers.

1849 the amount of lumber received at Chicago amounted to 73,259,553 feet; in 1855 to 326,553,467 feet. Twenty years ago Chicago and the surrounding district imported grain for food; in 1853 the amount of grain exported was 6,500,000 bushels, and in 1855 the export of grain amounted to 16,633,813 bushels,—the total amount received into the city in 1855 being 20,487,953 bushels. The value of beef packed in Chicago in 1851 was about 130,000*l.*; in 1855 about 230,000*l.* The value of real estate in Chicago which is stated to have been 360,000*l.* in 1840, and 1,600,000*l.* in 1850, was estimated at 8,200,000*l.* at the end of 1855.

Railway Legislation.

The necessity which communities in a new country feel for means of intercommunication led the Legislatures and the people of the several States to give as many inducements as possible to the construction of railways. The owners of the land had, generally speaking, no ties to the soil and regarded their farms as an investment to be materially benefited by the proximity of a railway; they therefore usually afforded every assistance to its progress. But occasionally, no doubt, they have exacted what was, in America, a high price for their land. American railway companies have, however, on the whole been subject to very much lower charges on this account than English railway companies.

Railways in the United States appear to have been constructed under four different arrangements:—

1st. By the State.

2nd. By a company to whose share capital, or mortgage debt, the State has contributed, retaining an interest in the line and some power of interference.

3rd. By a company to whom lands have been granted, but which otherwise has not been interfered with.

4th. By a company unassisted, and therefore not interfered with.

1st. The railways made by the State do not appear to have been successful. The officers who are appointed to manage them are chosen by universal suffrage, sometimes annually, sometimes triennially; they are elected rather for political reasons than for being specially qualified for the duty. State railways have consequently not proved remunerative, and they have generally been transferred to private companies.

In Pennsylvania the line between Philadelphia and Harrisburg is held by the State, which maintains the road and furnishes locomotive power. The cars for passengers and freight are supplied by any parties who will place them on the road, paying a specified toll and adhering to certain regulations. The management of and the returns from the line are not satisfactory under this system, and it is in contemplation to transfer the working of the line to the Pennsylvanian Central Railway Company, which forms a continuation of it.

2nd. The States and municipal corporations have, in several instances, given assistance to railway companies. In most cases the State or the corporation of the town has reserved to itself the right of appointing directors in proportion to the amount contributed; but as these directors are generally elected by universal suffrage for short periods, they often desire to regulate the management of the railway more with reference to local political objects, than to its interests as a commercial speculation.

This arrangement is therefore false in principle, and combines two conflicting elements. If the railway is a commercial speculation, the management should be left to the Company; if, on the contrary, it is to be worked with a political object, the commercial element should be left out of view, and the line be wholly managed by the State.

When the State has advanced money to a railway company, the only sound principle upon which a power of interference should be reserved to the State would seem to be this: to take security that the money shall be properly applied to the work, to require publicity of the accounts of the company, and to lay down specific terms upon which the traffic is to be conducted; but to leave to the company full powers of management, subject to these conditions.

3rd. The mode by which the State induces a company to construct a railway by grants of land is one which deserves attention, as being especially applicable in many of our colonial possessions.

This system is resorted to in the Western States with a remarkable degree of success. In these States the fertility of the soil cannot be made available without means of communication, and any amount of land is well applied which will induce a company to construct a railway. In all new territories the land is surveyed in lots each containing a square mile. The railway company, to whom land is granted, is allowed to take, in addition to the actual land required for the line, a specified quantity in alternate lots on each side within a certain distance from the line. In case any of those lots which would naturally fall to the company should have been previously bought by individuals, the railway company selects other lots.

This system gives security to capitalists for their investment. It makes it the interest and the business of the company to publish the merits of the district, and, by offering facilities to the travelling public, to induce the settlement of the country; hence, the value of the alternate lots of land which are retained by the State is increased.

The State, in granting the land, generally reserves a per-centage on the gross receipts of the company. On the Illinois Central Railway this amount is 7 per cent.

As the progress of this railway affords a striking illustration of the advantages of this method, it appears desirable to give a brief account of it.

The company was formed for the purpose of making a railway through Illinois from Cairo, at the confluence of the Ohio and Mississippi, to Dubuque on the Mississippi, with a branch line to Chicago. Its course lay chiefly through prairie land, only inhabited at a few points. On the 20th September 1850, Congress granted to the State of Illinois 2,595,000 acres of land to aid in the construction of the Illinois Central Railroad. The vacant lands, in alternate sections within 6 miles of the road, were conveyed by direct terms in the grant, and, in lieu of such portions as had been previously sold, selections were authorized to be made between 6 and 15 miles on each side of the road. The company was incorporated by the Legislature of the State of Illinois in 1851, and the grant conferred upon it. The company created a capital stock of 17,000,000 dollars, on which 25 per cent. has been paid; and, for the additional money required for the construction of the railway, they have raised 20,000,000 dollars by mortgage on the security of 2,345,000 acres of the land granted to them, and they have reserved 250,000 acres, the proceeds from which are to assist in paying the interest on this mortgage.

The ordinary price of new land in the States is one dollar per acre; the Company are selling the land at prices varying from 5 to 25 dollars per acre, which is paid for in five annual instalments with 3 per cent. interest. When the last instalment has been paid, commissioners appointed by the State grant a title to the purchasers of the land upon the railway company producing to them such a number of mortgage bonds cancelled as amount to the price they have received for the land.

This line runs for the greater part of its course through prairie land without trees, land, which with a small expenditure of labour, produces most luxuriant crops.

When the line was first opened the country was nearly uninhabited; stations were placed at every 8 or 10 miles, round which villages and in some cases towns have sprung up, and fields of corn and herds of cattle are now to be seen on every side. If well managed, this railway should prove most lucrative to the shareholders. It has already largely developed the resources of the State, and the per-centage which it pays to the Government will eventually relieve the State from taxation to a considerable extent.

4th. A large number of railways have been constructed without State assistance.

It is, therefore, desirable to describe here the arrangements under which railway companies are ordinarily incorporated.

In a majority of States general railroad laws have been passed, enabling corporations to be formed for making railways, the course of which is to be approved of by Railroad Commissioners or by some executive authority, due notice of the intended route being given in order that all persons affected may have an opportunity to object. Very large discretionary powers are left with the commissioners as regards crossing roads, streets, rivers, &c. But as a general rule the companies prefer special charters, which confer greater privileges. A pro-

jected railroad is sometimes opposed on grounds of public inconvenience, but I was informed that opposition by individuals on private grounds is unknown, and would not be tolerated.

The company receives powers by its charter to take all necessary land, the mode of compensation varying in the different States. In some States the Courts appoint juries of twelve or of seven persons to determine the value. In other States a jury of twelve persons is named in the usual manner, from which each party alternately strikes off one until six are left. In other States the Court of the county names commissioners to make awards.

The decisions are not in all cases final; an appeal may sometimes be carried into some Court of the State.

In some States, as, for instance, in Ohio, the law provides that the appraiser shall consider the probable benefit as well as the injury which the owner will sustain.

The power to cross roads or streams of water is generally limited, by the company being required, without unnecessary delay, to place such road or stream in a condition not to impair its former usefulness. Occupation roads must be provided when necessary.

In towns traversed by a railway, or at which the railway terminates, the company is frequently allowed to lay the rails along the public streets, provided the streets be not unnecessarily obstructed, nor the surface unnecessarily altered thereby.

The charters generally prescribe a maximum charge for the conveyance of passengers of 3 cents (equivalent to $1\frac{1}{2}d.$) per mile.

For the conveyance of goods it is not usual to limit the charges, but in some cases they are fixed at the average rates charged by other specified railway companies.

It is enacted to be the duty of a railway company to keep its railway in repair and open for public use, to supply sufficient accommodation, and to transport merchandise and property, without partiality, favour, or affection, and with all practicable despatch: in some cases the company is made liable to a penalty for neglect of the duty thus imposed. Railway companies are prohibted from being bankers, brokers, or dealers.

In some charters a priority is given for the conveyance of military and military stores, in others they are required to be carried at half price in time of war, and clauses are sometimes inserted requiring the conveyance of the mails; this latter subject will be alluded to hereafter.

The amount of capital stock to be raised is specified in the charter, and the subscribers thereto are usually required to pay five per cent. on the amount of their subscriptions.

The amount to be borrowed is limited in some cases to half the capital paid up, in other cases to the amount of the authorized capital stock, and in other cases no limit is placed upon the borrowing powers.

The bonds must, in some States, be registered in the office of the Comptroller of Public Accounts or the office of the Secretary of the State.

Almost all railway companies are required to furnish annually detailed statements to some State officer, showing the nature and condition of their line and working stock, the amount expended in construction, and the amount of working expenditure, classified under specified heads, as well as the receipts from traffic. This information is not, however, generally published.

A power of inspection of existing railways by Government officers is reserved in some States.

In Connecticut, three commissioners are appointed annually by the Senate for each railway, who are to examine the whole railway at least twice in each year, and as much oftener as, in their opinion, the public good requires; and to make a like examination of any railway within the limits of any town, when requested in writing by the select-men of the town, also to see that the railway is kept in suitable repair, and that the corporation faithfully complies with the laws of the State and the provisions of its charter; and to report the result to the Legislature. If the commissioners are of opinion that safety to the public travel or to the lives of persons employed on the railway require that it should be repaired, they are to give notice to the company that the repairs must be made within a specified time, and if the company neglect to make the repairs within the time limited, they are to pay 100 dollars per day to the State. The commissioners are paid by the company.

In New York, the supervision of railways is entrusted to an organized department of the state. There are three railroad commissioners, viz.—1st. The state engineer and surveyor, who is *ex-officio* president; 2nd.* A person elected by the stock and bond holders of the railway corporations; and 3rd. A person appointed by the Government by and with the advice and consent of the Senate.

The expenses of this department are defrayed by the railway companies, in proportion to their gross receipts. The duties of this board are as follows:—

I. To proceed against any railway company which may either have exceeded its powers, or failed to comply with the provisions of its Acts, or have incurred forfeiture of its franchises; twenty days' notice of the process is to be given to the company.

II. A company proposing to open any railway is bound to give twenty days' notice to the commissioners, who, ten days before the proposed opening, are to inspect the same, and the shops, buildings, machinery, fixtures, engines, and cars, and all the works of the company, and if satisfied that the road and works are in a proper condition to be opened for public use, the board are to allow the opening by their certificate in writing; if the road is not in their judgment in a condition to be used safely, or if the works, buildings, or machinery are in any way defective, they are to inform the company of the particulars, and to postpone the opening for thirty days.

The Act lays down the following particulars as indispensable before the opening of a railway, viz.:—

1st. Proper fencing.

2nd. At public and private level crossings suitable cattle guards.†

3rd. A sufficiency of suitable ballast.

4th. The bridges to be capable of supporting double the stress which would be produced by a train of five cars, weighing 150 tons, travelling at forty miles per hour.

5th. Suitable sidings, water stations, station buildings, storehouses, and rolling stock, and all the equipments necessary to perform without inconvenience or delay all the passenger and freight traffic which will probably be offered for transport within one year after the opening of the road.

III. Every railway company must report to the commissioners the occurrence of accidents to passengers. The commissioners are empowered to inquire into the causes of every accident, and for that purpose to examine everything connected with the railway or the management thereof, and to subpœna witnesses and examine them on oath. The commissioners make a report upon the accident, stating their conclusions, and making suggestions for promoting the greater safety of the public. A copy of their report is sent to the company, with such directions as the commissioners may deem necessary to secure the *greater safety* and *benefit* of the public. If the company fail to comply with the directions, the board are to report the neglect to the Legislature.

IV. Bylaws made by the railway companies are to be approved of by the board.

V. In addition to the information as to the financial position of companies, and the condition of the lines already mentioned, the railway commissioners may require from a railway company any further information they deem expedient; and the commissioners are required to examine, either by themselves or by deputy, at least once a year, into the general condition, management, and affairs of the several railroad corporations, and for this purpose they have power to inspect all books and papers, and to examine the officers, clerks, and assistants upon oath.

The board make a general annual report of the information they have obtained, and it is their duty to suggest additional legislation if requisite.

It will be observed that this Act is founded upon the same principles as the English railway law, viz., that a railway shall not be opened until, in the opinion of a Government department, it is ready to receive traffic safely, but that after the line has once been opened the State retains no power over it, except that of inspection. But the New York Legislature has made this power of inspection

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* The member elected by the corporations appears to be the acting member of the Board. The gentleman at present holding the appointment is Mr. M'Alpine.

† A contrivance to prevent cattle from straying on the line, which will be described hereafter.

a reality, instead of its being merely nominal, as in England. The Railroad Commissioners of New York have full power to inquire into the financial position of railway companies, and to publish such inquiries; they have also full power to inquire into the causes of accidents, and to make suggestions, and if their suggestions are not attended to, it is their duty to report the fact to the Legislature.

Constitution of Railway Companies.

A railway company is governed by a president and a board of directors.

The president is paid highly, and is selected for his knowledge of business and practical acquaintance with the management of railways. He devotes his whole time to the affairs of the company; in him is vested the whole executive power, and he is responsible for the efficient and economical working of the line. The directors are generally good men of business, but unpaid, excepting when they are required to attend continuously on occasional committees; they would appear generally to have the position of a consultative body to assist and watch over the president, and to be responsible for the financial position of the company and for the proper management of the accounts.

These officers are elected annually by a majority of votes present or represented by proxy at a general meeting. The proxy may be written in the simplest form, and no stamp is necessary; as a general rule a vote is given for each share. Special general meetings may be called by the directors on their own authority or upon a requisition of stockholders holding a specified proportion of stock, which is generally one tenth of the whole.

In some charters there is a clause making the individual directors liable for any dividend which would impair the capital stock.

Railway companies are not compelled to adopt a special form of audit as against the directors, as is the case in this country; but each company is free to adopt its own system, and the shareholders possess, and, when they desire it, exercise, the power of examining the accounts, appointing a committee for the purpose at the general meeting.

The transfer of shares is, in some cases, required to be registered in some public department.

I was informed that the shareholders do not exercise their power of changing the directors annually without sufficient reason.

The charter usually gives the company great latitude in the selection of its route. When, therefore, the charter is obtained, the company frequently selects the route upon which the land can be obtained on the most favourable terms. A large proportion of the share capital is frequently raised amongst persons on the line of railway, and most of the work is paid for in bonds issued often at a great depreciation: and a further floating debt is frequently incurred. From the report of the Railroad Commissioners of New York it would appear that the money raised for the construction of railways in that State may be divided into forty-seven per cent. by shares, forty-nine per cent. by mortgage bonds, and four per cent. by floating debt, unsecured.

The unlimited power of borrowing has, in some cases, acted injuriously on the economic working of the lines, by enabling the directors to resort to that source rather than to reduced expenditure for paying dividends.

When the profits have been very large, as is the case on some of the western lines, the Chicago and Galena and Chicago and Burlington for instance, a large amount of nominal capital has been created to reduce the apparent dividend, and so to prevent the legislature from requiring a reduction of tolls.

The accounts of railway companies rendered to the shareholders present as many differences of form as exist in this country, and in many cases the forms of account of the same company vary in different years. The modes of keeping the accounts and books of the companies vary very much; as a general rule their system of audit, between the several officers of the companies, appeared good.

The great differences which prevail in the systems in use on different railways in America, the necessity for opening the railways before they are in a tolerably complete condition, the unlimited power of borrowing, and other causes, render the question of the security of investment in American railways one of personal confidence in the managers to a greater extent, probably, than is the case in this country.

From what has been stated, it will have been evident that the high value of capital and the existence of a wide extent of territory, where railways were urgently needed, in the United States, were causes sufficient to prevent the construction of lines which competed at many points, as has been the case with railways in England, and competition is generally limited to long through traffic.

I have endeavoured to form some idea of the financial position of American railways, and with that object have tabulated in the Appendix the information from such annual reports of railway companies as I obtained, and from reports of the State officers of New York and Massachusetts, with the view of comparing the results with English railways. (See Tables Nos. 1, 2, 3, 4, 5, and 6.) The results appear to be generally as follows, viz.:—

The cost per mile of railway open averages from 10,000*l.* to 12,000*l.* on the New York and Massachusetts railways as compared with 35,000*l.* on British railways.

The earnings per mile run by the trains average 77·28*d.* for Massachusetts railways, 88*d.* for New York railways, and 91*d.* for the other railways mentioned, as against 68·45*d.* for England; the expenditure per train mile being 47·52*d.*, 50*d.*, and 52*d.*, compared with 38·22*d.* for England. The receipts per mile of railway are 1,397*l.* in Massachusetts and 1,576*l.* in New York, compared with 3,013*l.* in English railways; the working expenses per mile of railway in those States being 857·65*l.*, and 892·66*l.*, compared with 1,504·39*l.* for English railways.

It appears, from the figures I have obtained, that the number of trains are fewer in proportion to the traffic; and that those trains are better filled than ours.

The charge for maintenance of way is high as compared with that on English railways, and the proportion which the working expenses bear to the receipts from traffic is higher than in England, being fifty-six and sixty per cent. of the receipts as compared with forty-eight per cent. on English railways. The high cost of maintenance of way is, probably, in part due to the necessity for removing snow in winter; but the generally large proportion which the working expenses bear to the receipts as compared with English railways is due, partly to the less perfect condition of the lines, and partly to the higher value of labour. I have appended a table (No. 7), which shows the average wages paid to the different classes of railway servants on one of the principal railways in the United States; viz., the New York and Erie Railway. From this it appears, that an engine-driver receives on an average between 11*s.* and 12*s.* per day; the wages of a fireman and a porter average between 4*s.* and 5*s.* per day; and a platelayer earns about 4*s.* per day.

The above results show that the number of trains is better adapted to the requirements of the traffic than is the case with us; that the original cost of the railways has been much smaller than that of English railways; that the cost of working in proportion to the receipts is on an average larger than in this country; and that the proportion which the profits bear to the capital invested is between five and six per cent. in New York and Massachusetts, and more in the Western States, as compared with three or three-and-a-half per cent. on British railways. But it must be borne in mind that the ordinary rate of interest in the United States on the best securities is as much as six, seven, or eight per cent., and that, consequently, the profits on railways in the eastern States do not bear a very different ratio to the ordinary rate of interest than is the case in this country.

Construction.

Construction of Road.

The character of American railways, so different in its prominent features from that of railways in this country, is the result of the want which they have been called upon to supply. A means of communication was required which could be laid cheaply and rapidly through forests and uncultivated districts where high speed was of far less consequence than certainty of communication. A railway was the instrument best adapted to supply this want, and it would afford a better means of communication at a less cost of maintenance than an ordinary road.

As the first cost of a railway was a more important consideration than the after expense of working the line when made, sharp curves and steep gradients were unhesitatingly adopted, and the railways were opened with a minimum of accommodation. The Baltimore and Ohio Railway affords a striking illustration of a line opened with steep gradients, which have since been improved. In order

to avoid for a time an expensive tunnel, which has since been constructed, the line was carried by a series of zigzags, ascending over a hill by a gradient of 1 in 18 at its steepest part. Each zigzag terminated in a short level space, so that the train was run up one zigzag on to this level space, and then backed up the next zigzag, and so on. The load which could ascend in this case was of course very small. There are curves on this railway of 360 feet radius, and curves of 400 feet radius are common; the railway follows the sinuosities of the valleys in its passage across the Alleghany Mountains: it is also carried through the streets at Baltimore down to the wharves, and passes round right angles. In these streets the traction is by horse power.

The embankments and cuttings of a railway at its opening are generally completed; the bridges are ordinarily of timber, which, not being always well seasoned, is often a cause of considerable expense. The designs of many of the bridges for large spans, and also of the roofs of stations in which timber alone, or timber in connexion with iron is used, exhibit great engineering skill, and are very instructive. The railway bridge of largest span is the suspension bridge over the Niagara river, connecting the United States with Canada. The span of the bridge is 800 feet; and the level of the rails is 250 feet above the water. The particulars of this bridge have been already published in this country. On many railways, iron and stone are being adopted to replace timber structures which have decayed. I have appended a sketch of one iron and one wooden bridge of recent construction, which well deserve consideration. (*See* Plates No. 2. and 3.)

The ballasting is generally very deficient at first. On the prairie lines it is impossible to procure ballast except from very considerable distances. In constructing these lines a ditch is dug on each side of the road, and the soil banked up so as to cover the centre of the sleepers, but sloped off on each side, leaving the ends of the sleepers exposed, in order to allow rain to drain off rapidly.

The elasticity of the soil makes these roads far from disagreeable to travel over when dry; but in wet weather and frost the absence of ballast is a source of great inconvenience and danger. This may be remedied, to some extent, by placing a good drain under the centre, as well as at the sides of the roads; but nothing can compensate for the absence of ballast which, in a severe climate like that of America, should be of broken stone, not less than two feet in depth under the sleepers, with good drainage; it is sometimes customary to slope the top of the ballast on each side, so as to cause the snow melted on the surface to drain off.

The gauge of American railways varies: the general gauge in the United States is 4 feet 8½ inches; the gauge of the Ohio railways is nominally 4 feet 10 inches, but it is in many cases in practice made 4 feet 8½ inches. The New York and Erie, and one or two lines in connexion with it, have a 6 feet gauge. The gauge of Canadian railways is 5 feet 3 inches. The break of gauge is of less consequence than in this country, because there is not so much interchange of working stock between the several railway companies.

The sleepers on American railways are usually of oak, cedar, or hemlock spruce, of about 6 inches by 8 inches scantling, and from 7 feet to 9 feet long.

In consequence of iron being taxed to the amount of 30 per cent., the American railway companies have been obliged to economize iron to the utmost. The rails are made as light as possible, the usual form being the contractors' rail of from 50 to 65 lbs. weight. Many railway companies obtained rails from England, for which they paid by mortgage bonds. The rails thus obtained have not, it is stated, generally proved durable. With regard to rails obtained from American iron works, the plan is frequently adopted of contracting that the rails shall last a specified time, the failure of any rail being made good, together with expenses incurred in consequence. The rails are spiked to sleepers laid transversely, the joint being generally secured by means of a chair made of boiler-plate, with a lip cut out on each side and turned up; the lip is barely 3 inches broad, and projects about 1½ inches on each side of the joint. It is stated that the lip soon works up, and when hammered down is apt to break off; consequently the joints on a road of this description soon become very bad; and several plans have been tried to improve them.

On the New York and Erie Railway, in some places eleven sleepers have been placed under an 18-feet rail.

On some lines I saw a wrought-iron chair 14 inches in length, of the form shown in Plate No. 1., Fig. 3., made to slide on to the rail without any keys.

Several forms of compound rails, for avoiding joints, have been tried, but I was informed that they have invariably failed.

The ordinary fished joint had been tried, but the necessity for economizing iron, and of preserving a sufficient breadth of base, has so limited the depth and modified the form of the rail that it is not generally well adapted to this mode of fastening; and it was stated not to have proved successful. A modification of the fished joint, in which a piece of iron about 12 inches long is used on the inside of the rail, and a piece of oak 5 feet long on the outside, has been tried on the Baltimore and Ohio and other railways, and appeared to answer. This is shown in Plate No. 1., Fig. 2.

The switches and points in use upon English railways are almost unknown in America, shifting rails or contractors' points being universally used in lieu; and consequently, if the points are set wrong, the vehicles which pass through them must leave the rails. The result of this is that the points are almost always kept locked, and a signal is invariably attached to them.

On the Newhaven Railway, in order to render it impossible for the switches ever to be set except for the main line, they are worked from inside a box, the lever of the switches being connected with the door of the box, so as to shut it when they are held open for the siding; thus the pointsman cannot get out of his box unless the points are set right for the main line.

The signal arrangements at stations, and even at junctions, are generally very imperfect.

Level crossings are scarcely ever provided with gates or gate-keepers, except in special cases near towns; but a large board is placed over the crossing with the words printed on it in large letters:—"*Railroad crossing. Look out for the cars when the engine bell rings.*" On the Philadelphia and Reading Railway, a blue coloured light is shown at all level crossings at night.

It is the invariable duty of the engine-driver to ring a large bell, placed on his engine, whenever he approaches a level crossing or passes along a street.

Cattle-guards are constructed on each side of every level crossing, in order to prevent cattle and animals from straying on to the line. These are trenches about 4 feet deep and 4 feet 6 inches broad, cut across the railway, the rails being supported by narrow balks laid across the opening. Laths, a few inches apart, are laid across the opening to enable persons to pass over.

The railways are generally well fenced, except at stations or where the railway is carried along roads or streets, in which case no separation is made. The main line of the Baltimore and Ohio Railway runs through the streets at Baltimore to the passenger station; the trains are drawn by locomotives, and a man on horseback rides along in front of every train, blowing a trumpet, to warn people to keep off the track.

A very general practice prevails of distributing the goods traffic by means of rails laid along the streets to wharves and private establishments, along which the railway cars are moved by horse power. At some seaport towns in this country, as, for instance, Aberdeen, Dundee, and Birkenhead, rails are carried on to the wharves, but not to the same extent as in America. The practice is, however, one which might be adopted in many places in this country with great advantage, and with saving of expense in unloading and reloading. The construction of the cars in America enables them to be moved round very sharp curves.

The stations are generally unfenced, and passenger stations are considered public thoroughfares. The accommodation is generally inadequate and very indifferent, there being a great want of waiting-rooms and other conveniences, as well as of means of obtaining information. At some stations, however, where the passenger traffic is large, the booking-office has a second opening into the ladies' waiting-room, so that ladies travelling alone can obtain tickets without crowd or difficulty. This arrangement is one which might be adopted with great advantage in this country.

Construction of Rolling Stock.

The practice of constructing the railways in a hasty and imperfect manner has led to the adoption of a form of rolling stock capable of adapting itself to the inequalities of the road; it is also constructed on the principle of diminishing the amount of useless weight carried in a train.

This principle is, that the body of the car or waggon is carried by two four-wheeled trucks, one at each end. (See Plates Nos. 4 and 5.) The body is

attached to these trucks by means of a pintle in the centre, the weight resting on small rollers at each side. The main framing of the truck is supported on springs resting on the axles, and the pintle and rollers are fixed to a cross-beam, which is attached by springs to the main framing; so that between the body of the car and the axles are a double set of springs. India-rubber springs are in general use, but they often become hard; consequently sometimes steel springs are used, with great advantage. Any side movement which might result from the slight play allowed to the cross-beam is counteracted by springs placed between its ends and the framing. An iron hoop attached to the framing passes under the axle on each side, so as to support the axle in case it should break.

The bearings do not differ materially from those used in England. But the axle box is formed so as to allow of oil being used as a lubricator, as it is well adapted to withstand heat and cold. The oil is contained in the lower part of the axle box, cotton waste being pressed in to prevent it from shaking about, as well as to keep it in contact with the axle; the front is screwed on, and, at the back, a leather fits close round the axle, and prevents the admission of dust (see Plate No. 6.) It is stated that under favourable circumstances this kind of box will run sometimes for a month without requiring to be touched, but there is great difficulty in obtaining good oil.

The wheels used on American railways are of cast iron, with chilled tires. The wheels are from 30 to 36 inches in diameter, made without spokes, and generally of the section shown in Plate No. 4. These wheels, when made by the best makers, will run from 60,000 to 80,000 miles before the tires are worn, and they are said not to be liable to break; they weigh rather more than 500 lbs., and cost from 3*l.* to 3*l.* 10*s.* each; they are not of course so true as turned wheels, but their first cost is less; they wear well, and during the time they last they require no expenditure for turning up; any crack can be more easily detected by sounding with a hammer, and when a wheel breaks it does not always do the mischief that is done by a broken tire. Chilled cast-iron tires are used on some of the railways for the driving wheels of engines; they are made 3 inches to $3\frac{1}{2}$ inches thick, and 6 inches broad, and cylindrical; they are bored out to a true cone to fit the centre, which is also of cast iron, turned to a similar cone, and secured in place by screws. These chilled castings are stated to be preferable to steel, or to wrought iron, on account of their being less liable to fracture in frost.

The iron, of which they are made, is of a very superior quality, and great practical skill is necessary in the operation. It is stated that there are only three firms in the United States whose wheels are fully to be relied upon.

The only connexion between adjacent cars is at the centre, by means of the draw-bar; the draw-bar terminates at each end in what is termed a bumper, which enables it to act as a buffer, as well as a means of connexion. (See Plate No. 1, Fig. 1.) In the most approved construction of car the draw-bar is continuous under the car, and is attached to elliptic springs, which act in both directions.

No force is necessary in coupling the cars, as the ends of the draw-bar or bumpers, which are of the shape shown in the sketch, abut against each other; a shackle is introduced through the opening behind, and two pins are passed through the eyes; about an inch play being all that is allowed. An iron shackle is generally used; but on some railways the shackle is made of oak 18 inches long, 2 inches thick, 6 inches broad, with holes for the pins $1\frac{1}{2}$ inch $\times$ 2 inch, at a central distance apart of 12 inches. The block, as well as each hole, is bound with iron; but the iron band round the block is divided on each side at the centre, so that if a car leaves the rails the side wrench would break the shackle transversely.

In coupling passenger cars the man stands on the platform at the end of the car; but in freight cars, when there is no platform, the following self-acting contrivance for dropping in the pin, is sometimes adopted to prevent injury to the man employed. When two cars are to be coupled, the pin in the bumper of one of the cars is supported by means of a ball, and the shackle is fixed by its pin in the bumper of the other car; when the cars are moved one against the other, the shackle in one bumper pushes back the ball in the other, and allows the pin to drop into the hole.

All passenger cars, and almost all freight cars, are supplied with breaks, which are applied to all the wheels, worked from either end of the car. The blocks of the breaks are lined with plates of cast iron; and it is never intended that the wheels should be completely skidded.

On the Philadelphia and Reading Railway there is an arrangement by which a sudden check in the speed of the engine applies breaks to the wheels of all the cars.

Passenger and emigrant cars, covered freight cars, or low-sided and platform cars for timber and minerals, &c., are placed upon the trucks I have described. Upon some railways coal and ballast waggons are used, constructed in the same manner as those upon English railways.

The bodies of the passenger cars are from 30 to 45, and even 60, feet in length. This length renders it necessary that the sides should be supported by a truss, either in the framing or by iron trussing rods below. On lines of 4 feet 8½ inch gauge the cars are about 9 feet, and on the New York and Erie, 10 feet wide, and from 6 feet to 7 feet 6 inches high. There are two classes of passenger cars, of which one is limited to the conveyance of emigrants. In the centre of each end of the cars is a door, conducting to a small platform, about 2 feet 6 inches wide, from which steps descend on either side to the ground. There is a railing to the platform, with an opening to allow passengers to pass from the platform of one car to that of another, and thus through the whole train.

On many railways this free passage is not allowed to passengers, but the foremost door of each car is locked, so that all passengers must enter at the rear door, and the conductor or servants of the train alone pass through with keys.

The interior of the car forms a large room, with a passage, of from 1 foot 9 inches to 2 feet wide, down the centre, upon each side of which cross seats are arranged. These seats are intended for two passengers each; they are from 3 feet 3 inches to 3 feet 6 inches long, about 1 foot 6 inches wide, and 1 foot apart. The back is arranged to be turned, so that the passenger may sit with his face in either direction. The seats and backs are comfortably cushioned, and there is a window, and ventilator above, to each. A capacious netting is carried along each side, from one end to the other, for the reception of umbrellas, bags, and cloaks. In winter the cars are warmed by means of an iron stove in the centre; and they are lighted at night by lamps placed at the sides.

In a certain proportion of the passenger cars, a portion, about 7 feet long, 3 feet 6 inches wide, is partitioned off, in which is a small room for the convenience of ladies nursing, and a watercloset. In the summer iced-water is placed in water-coolers in the cars.

On some railways, where the journey occupies a considerable time, as for instance, the Illinois Central between Cairo and Dubuque, some of the cars are fitted with compartments about the size of our first-class carriage compartments, in which the seats are arranged for the backs to turn up, and so to form two tiers of berths, or sofas, for the accommodation of passengers who may wish to lie down. For these an extra price is charged.

The dust caused by the friable nature of the soil is the great inconvenience of summer travelling in the United States.

Several plans have been tried to avoid it. On some railways windows have been constructed, so that the sides should slant outwards and throw it off.

On the Michigan Central Railway a screen of tarred canvas is fixed so as to reach from the lower framing of the cars to within about 2 inches of the rails outside the wheels. The screen terminates in a framework, which is arranged to abut against a similar framework on the next car, so that from one end of the train to the other a tunnel is formed under the cars, in which the dust is confined, and can only escape at the end of the train. This plan prevents dust in the cars, but is said to cause heated axles.

On the New York and Erie Railway, the following plan secures freedom from dust and good ventilation. A funnel placed at the top of the car, faces the direction in which the train is proceeding, and the movement of the train causes the air to pass down this funnel into a chamber, where it is purified. A cistern of water is fixed under the car, and a pump worked by the rotation of the axles of the car forces the water into the chamber through jets arranged to fill the chamber with spray. The air, in passing through this spray, is freed from dust. In cold weather a stove is placed so as to warm the water. The air then passes through flues under the floor into the interior of the car. The windows must be kept closed. As this arrangement is in practical use on

several cars on the New York and Erie Railway, it would be well worthy of a trial upon English railways; especially in large saloon carriages. The drawings of a passenger car in Plates 4, 5, and 6 show this plan.

A baggage car, or a compartment of a passenger car reserved for baggage, is invariably placed next to the engine. The baggage cars are furnished with doors at the sides to facilitate the loading and unloading of baggage. Baggage cars are generally thirty feet long. Next to the baggage cars in the trains are placed the cars with the compartment for mails, or for the Express Companies, who undertake the parcels traffic.

Freight and cattle cars are usually covered. Their ordinary length is twenty-eight or thirty feet, and they are more strongly built than passenger cars.

Almost every car is provided with a break, which can be applied to all the wheels of the car. It is worked from either end, so that one man can work the breaks of two cars. In freight trains the guards usually pass along over the tops of the cars; the small number of bridges and tunnels rendering this course safer than it would be in England.

In every train a simple and perfectly effectual communication between the guard and engine driver is provided by means of a cord. In passenger trains a cord, with swivel-hooks at each end, is provided to each car. It passes through rings in the ceiling, and it is the duty of the conductor to see that the communication between adjacent cars is complete before a train starts. In freight trains the cord is passed over the tops of the cars. This cord is attached to a bell on the engine.

The construction of a train on American railways favours this mode of communication more than on English railways. The carriages are longer, and therefore there are fewer of them, and consequently fewer connexions to be made; and these connexions are between rigid draw bars, without expansion or contraction of buffer springs; and as a person can walk from one end of a train to another, these connexions are made very easily, and any omission is immediately detected.

From above account it will be seen that the rolling stock on American railways differs considerably from that in use in England.

In designing their rolling stock, the Americans appear to have taken their ideas more from a ship than from an ordinary carriage, and to have adopted the form best calculated to accommodate large masses with a minimum of outlay for first cost, as well as the one which involves a minimum of attendance upon the passengers in getting in and out of trains. Whilst the cars have been designed with a view to avoid every appearance of privilege or exclusiveness, or of superiority of one traveller over another, they have been constructed so as to secure to every traveller substantial comfort and even privacy.

There is only one class, but as the cars are designed with more regard to comfort than English railway carriages, this class is very much superior to second and third class carriages, and only inferior to the *best* first-class English carriages. It is much to be regretted that almost all English railway companies have so entirely disregarded the comfort of second and third class passengers, although, as a general rule, second-class and sometimes even third-class passengers pay a higher fare than is required for the much superior accommodation of American railways.

No doubt the American railway cars cannot contain so many passengers as would be contained in a carriage of equal length divided into compartments, but the use of a door at each end, in lieu of several at each side, effects a saving in first cost, as well as in subsequent trouble to the company's servants, and allows the cars to be made wider than they could be with side doors, steps, &c. It is also very convenient for the passengers to be able to move about, especially on a long journey. The absence of compartments facilitates ventilation, warming, and lighting at night. There is an advantage derived from the use of trucks, which deserves consideration, viz.: that carriages can be moved easily round curves, and that consequently there is some diminution in the resistance of curves; and the use of double springs renders the motion of the cars very easy on a good road. Indeed, these cars travel without accident over bad roads at velocities, when our carriages would probably leave the line. The small diameter of the wheels possibly increases the friction to some extent.

Vehicles of this description would be very convenient in this country on all omnibus lines, and for second and third class traffic; but it is likely that many

English first-class passengers would prefer the privacy of a compartment. The use of this description of vehicle would, however, probably render necessary a reconsideration of the mode of buffing and coupling carriages together, if not the adoption of the *bumper* at the centre. This mode of coupling entails very much less risk upon the companies' servants than the mode in use in this country, and it prevents the possibility of danger arising from the couplings not being properly screwed up; and the use of a rigid draw-bar through the train would afford an easy means of enabling the engine driver to apply breaks simultaneously to all the wheels of the train. The mode of connecting American cars affords rather more protection than ours against that class of accident in which one carriage is forced through the adjacent one, as in such cases the platforms at each end, amounting to five feet of space, must be crushed before the body of the car is injured.

The main advantage of the American cars is that they convey a larger number of passengers, in proportion to the dead weight, than can be conveyed in the carriages generally used on English railways.

On the Baltimore and Ohio Railway, on account of the sharp curves, the cars are shorter than on many other lines, viz., 40 feet in length; these cars will contain sixty persons, and it was stated that they weigh about seven tons. As a general rule on English narrow gauge railways the same number of second-class passengers would scarcely be accommodated under a weight of ten tons.

The passenger car of the New York and Erie Railway Company, of which a drawing is given, is 60 feet long, and would contain above 80 people.

The freight cars on the Baltimore and Ohio Railway, 28 feet long, with a capacity for a load of 9 tons, weigh 6 tons. On narrow gauge English railways, as a general rule, the weight of the goods waggon is not much less than the weight of load.

Engines.—The American engines are constructed upon principles somewhat analogous to those on which the cars are constructed, with the view of obtaining great stability on roads which present at certain seasons considerable irregularities of surface. The weight rests as nearly as possible upon three points; the fire-box end being supported on the driving-wheels, and the smoke-box end upon a pin which rests in the centre of a small truck. The driving-wheels are generally four in number, coupled together, with from 5 feet to 5 feet 6 inches diameter, and placed at about 1 foot 6 inches apart. The hinder pair of wheels is furnished with flanges, but the leading driving-wheels are generally without flanges, and are frequently cylindrical.* When great speed is required the wheels are increased to 6 feet diameter,† but it is the almost invariable custom to couple four wheels in all engines. (See Plate No. 7.)

For working steep inclines, engines with eight wheels coupled are used, the wheels are cylindrical and about 3 feet 6 inches in diameter, the leading and trailing wheels alone have flanges. In attaching the framing to the springs the compensating balance lever is used. Some of these engines weigh 30 tons, the position of the engine driver being on the top of the boiler.

In the ordinary engines the truck is made as light as possible, its wheels being generally from 2 feet 6 inches to 2 feet 9 inches in diameter, and about 1 foot 6 inches apart. These wheels are of chilled cast iron, similar to the car wheels. The driving-wheels are generally of cast iron in the centre, and the tires are of wrought iron or sometimes, as has been already mentioned, of chilled cast iron, which is stated to be better able to stand frost.

In most engines the cylindrical part of the boiler, instead of butting against the fire-box, is connected with it by an inclined plate, so that there is no right angle at that part.

Notwithstanding that the coal fields of the United States occupy an area of 130,000 square miles, and extend into Pennsylvania, Ohio, Indiana, Illinois, Kentucky, Virginia, and Michigan, until very recently wood was the fuel invariably used on American railways. Wood has, however, risen very much in price lately; and on the prairie lines wood is not to be had, but coal is found in their vicinity; on other lines, which pass through the coal measures,

* Since my return to England I have been informed that a great saving in wear and tear has been effected on an Austrian railway by the use of cylindrical wheels. It is stated that the tires do not wear sharp, they last one-third longer, and that the oscillation of the carriages is much less than with coned tires.

† On the Philadelphia and Reading Railway there is an engine, constructed by Mr. Mulholland, with four 7 feet driving-wheels coupled, 17 inch cylinder, and 30 inch stroke. This engine weighs nearly 28 tons, of which 12 tons rest on the leading truck, the remainder being distributed between the driving wheels.

coal is a cheaper fuel. Hence its use is gradually being extended on railways, and it will probably soon entirely supersede wood.

Several attempts have been made to burn bituminous coal in engines, without coking it. In one, the fresh coal is supplied into the fire-box from below, so as to under-lie the heated fuel; in another, the fire-box is divided into two parts, from each of which a flue, with a damper, leads to the tubes, and there is an opening below the surface of the fuel from one part of the fire-box to the other. The fires are alternately charged with fresh fuel, the damper of the fire most recently charged being closed, to cause the smoke to pass through the other fire. I cannot give any decided opinion as to the satisfactory results of either arrangement. This subject is receiving at the present time great attention in this country, and the economical results which are stated to have been arrived at by Mr. Beattie in some new engines which he has constructed for the London and South-western Railway are very extraordinary.

Anthracite coal is used on the Pennsylvanian railways. A form of fire box, adopted by Mr. Mulholland on the Philadelphia and Reading Railway is stated to be very successful. (See Plate No. 1. Fig. 5.) It is shallow, with a large grate area; the bars are of cast iron, $\frac{3}{4}$ inch broad, and with $\frac{1}{2}$ inch spaces between them; and a row of air holes four inches deep by $1\frac{1}{2}$ inches wide, which can be opened and closed at pleasure, extends along the front of the fire-box, just over the bars. There is also an arrangement to admit air to the heated gases near the tube plate. The anthracite coal is spread evenly over the grate bars in a layer nine inches thick. The fire-box is made of iron, as is almost invariably the case in America, the sides being considerably sloped inwards to ensure that the steam generated from the water in contact with it shall pass off rapidly, and keep the water in constant contact with the iron.

It may be mentioned that the contract for the supply of boiler plate from the makers is frequently similar to that for rails, viz., that if defects in original manufacture are discovered, the plate is to be made good, and all expenditure incurred upon it defrayed.

In those engines in which wood is burned, the chimney is surrounded with an inverted funnel of iron, with a grating at the top to catch and contain the sparks. A door at the bottom of the funnel allows the ashes to be removed when necessary.

American engines are provided with what is termed a "cow-catcher," in lieu of axle guards. It is composed of a series of iron bars uniting in a salient angle, formed to throw to one side any thing that lies on the track. The lower bar is about three inches from the rail, and the upper part terminates at the framework of the truck.

This implement derives its name from having been used to protect the engine from cattle straying on the line, and with a moderate depth of snow it answers all the purposes of a snow plough.

Every engine is furnished with a bell of at least 30 lbs. weight, which is always rung by the driver before the engine is moved forward at a station, and also when approaching level crossings, or moving along streets. The bell gives notice of the approach of the engine without frightening horses, as much as the whistle. The side from which the sound proceeds can be easily distinguished, and in the neighbourhood of towns it is a much less objectionable sound to the inhabitants. The whistle is used on emergencies, and as a signal to apply the breaks, &c.

There is one arrangement connected with the engines in America which mere humanity should cause to be adopted in this country, viz., the protection afforded to the engine-drivers and firemen against the inclemency of the weather. The foot-plate of the engine is covered by a roof supported by glazed sides and a glazed front. The windows are arranged to open readily, and a passage is afforded to the front of the engine. This shed is open at the back towards the tender.

This arrangement makes the engine-drivers and firemen much more comfortable, and enables them to keep a far better look-out than when unprotected.

Management.

In a newly-opened country, where the traffic is not sufficient to require more than one or two trains each way daily, and where the stations are far apart, considerable time is allowed for the journey, and a train is not stopped at a station unless there are passengers to take up or set down, or there is freight to be left or taken on.

Under such circumstances, the station service may be performed by an occasional assistant, and it becomes more economical to place upon the train a responsible person, who regulates the movements of the train and collects fares, &c., and to place subordinate servants, if any, at the stations; rather than, as is the case in this country, to place responsible persons at the stations, and subordinate servants on the trains.

The practice of allowing only one class of passengers, due to the democratic tendencies of the people, renders it necessary that there should be some recognized responsible person in a train to maintain order and prevent the oppression of the weak by the strong.

It appears to be from these causes that the practice, universal in America, has grown up of placing a train in charge of a "*conductor*," who, like the captain of a ship, has full control over its movements, exercises a kind of police over the passengers, and is the guardian of ladies or children travelling alone. This person could not, however, discharge his duties unless he had the power of moving from one part of the train to another. He has under his orders the engine-driver and fireman, a baggage-man, to whom is entrusted the duty of receiving, classifying, and giving out the baggage of the passengers, and one breaksman to every two cars. With freight trains the conductor has under his orders three or four breaksmen. This staff of servants is much larger than is furnished on trains on English railways, but it has, probably, been found necessary to send sufficient assistance with a train to meet cases of accident, and to be at hand to assist in maintaining order if necessary.

The large majority of lines in America are single, and the complications which arise in working them are mainly due to the unpunctuality of trains timed to meet one another. The usual system of working is as follows:—

The trains are all arranged to run to a time table, with a copy of which each conductor is furnished. So long as the train adheres to this time table all other trains are bound to keep out of its way.*

If the train fails to adhere to the time table, the train due to meet it, after waiting a specified time—on some lines a quarter of an hour, on some lines half an hour or an hour—proceeds as if nothing were amiss, the other trains being then bound to keep out of its way. The system on one or two lines was, that, when late, both trains should proceed at a slow pace until they meet, when the train nearest to a station should back to allow the other to pass. Occasionally trains of an inferior class are started to find their way between the regular trains.

It will easily be perceived that, under such a system, the duties of the conductors may, in some cases, involve calculations of which they scarcely possess the elements; and when the traffic is large, as for instance sixteen to twenty trains in twenty-four hours, the unpunctuality of one train must so delay the whole traffic as to entail serious loss of time and consequent expense.

It is extraordinary that considering the use made of it for other purposes, the Electric Telegraph has not been more largely resorted to for assisting in the working of American Railways. It is, however, in use on a few lines under two systems which I now propose to describe.

The Morse instrument is the one invariably used, the message being recorded on a slip of paper, or, if the operator prefers it, read by sound. A special wire is reserved for the purposes of the trains.

The first system is as follows: at each station there is a telegraphic instrument in connexion with the line wire allotted to a certain district.

Each time a train passes any station, the name of the train and the time of its passing the station is telegraphed. As the wire passes through every instrument in the district, this message is read by every station clerk, and is entered by each into a book.

It is the duty of the conductor of a train to keep himself well informed, by means of this book at each station, of the position of all the trains which have any influence over the movements of his train. And if either of two trains, timed to meet at a particular station, is late, the conductors of the two trains should make arrangements by telegraph for a meeting place different from that

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* In the case of freight trains, when the amount of freight to be conveyed is more than one engine can draw, a second, or even a third train is despatched after the first at an interval of probably a quarter of an hour; all these trains being considered to be parts of the *one* train, and under the control of the same conductor.

specified in the time table. This system is in use on some of the Canadian Railways. It leaves with the conductors of the trains the responsibility of making arrangements at variance with the time table.

The second system places the responsibility of altering the time table, when circumstances render it necessary, upon an officer who is acquainted with the movements of the trains over the whole line, or the particular section of it committed to his charge. This system is as follows:—The line is divided into as many sections as the requirements of the traffic render necessary; upon each section, in some convenient situation, is placed an officer, called a "Train Despatcher," to whom is telegraphed the time at which every train arrives at, departs from, or passes each station.

Thus the train despatcher has continually before him the position of every train on the line, which he lays down upon a diagram board prepared for the purpose.

So long as the trains are working in accordance with the time table, this officer does not interfere; but when he observes that a train is delayed so much that it will interfere with the movements of some other train, he sends a message, distinctly expressed, through the clerks at the nearest available stations, to the engine drivers and conductors of both trains, to alter the place of passing fixed in the time table; thus furnishing them with a revised time table. The message sent by the train despatcher is followed by the signal, "How do you understand this?" and the order is not to be obeyed until the train despatcher has signalled back to say that the conductor's version is correct.

The train despatcher is thus enabled to prevent the useless delay of trains, and to compensate for the impediments arising from the variations of weather, and other accidental circumstances, which prevent a time table from being rigidly adhered to. If from any cause he fails to send a message, the only result is that the trains are delayed to the same extent as would have been the case if there had been no telegraph.

This system might be applied with advantage on double lines of railway, to regulate the movements of trains, and prevent delays on lines where a large mixed traffic is carried on; as, for instance, where fast passenger trains, or special cattle trains, are timed to pass slow trains, when ignorance of the position of a train often causes great delay and consequent expense, and also increases the chances of accident. On lines where the electric telegraph is in use, the clocks at all stations are regulated daily by it at noon.

The electric telegraph is also used on some railways to notify daily, at a particular time, the number and description of cars lying at each station, as well as the number required for moving the freight from each station, and orders for distributing the cars according to the requirements of the traffic are then forwarded by telegraph.

This system of telegraphic working, more perfect than any I have seen elsewhere, was first introduced by Mr. M'Callum, the Superintendent of the New York and Erie Railway.

This railway possesses very inferior gradients to the New York Central Railway, with which it is in competition for western traffic; and Mr. M'Callum has introduced a very careful system of working, by which it is enabled to compete successfully with its rival.

As the system, taken as a whole, presents many features of interest, and exhibits a high degree of centralization in the working, I shall endeavour briefly to describe it.

It may be premised that the New York and Erie Railway, with its subsidiary lines, is above 550 miles in length, extending from New York to Dunkirk, Buffalo, and Niagara. It possesses 168 miles of double line, and 387 miles of single line. The gross receipts per mile were 2,316*l.* for 1855. This amount of traffic is about the same as that on the Eastern Counties Railway in this country for the same period.

The idea upon which the system is founded is, that to work a line efficiently the responsible head must possess a complete daily history of the details of working in all their minutiæ; and the following general principles are laid down to carry it into effect.*

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* These extracts are from a report made by Mr. M'Callum to the Directors of the New York and Erie Railroad, dated 25th March 1856.

" 1. A proper division of responsibilities.
" 2. Sufficient power conferred to enable the same to be fully carried out, that such " responsibilities may be real in their character.
" 3. The means of knowing whether such responsibilities are faithfully executed.
" 4. Great promptness in the report of all derelictions of duty, that evils may be at " once corrected.
" 5. Such information to be obtained through a system of daily reports and checks, that " will not embarrass principal officers, nor lessen their influence with their subordinates.
" 6. The adoption of a system as a whole, which will not only enable the general " superintendent to detect errors immediately, but will also point out the delinquent."

The general superintendent is solely responsible to the president of the line; the organization under the general superintendent being as follows:

" 1. Division and branch superintendents.
" 2. Masters of engine and car repairs.
" 3. Car inspectors.
" 4. General freight agent.
" 5. General ticket agent.
" 6. General wood agent.
" 7. Superintendent of telegraph.
" 8. Foreman of bridge repairs."

" 1. The several divisions and branches are in charge of superintendents, who are held " responsible for the successful working of their respective divisions, and for the main- " tenance of proper discipline and conduct of all persons employed thereon, except such " as are in the employment of other offices acting under directions from the general " superintendent's office, as herein-after stated. They possess all the powers delegated by " the organization to the general superintendent, except in matters pertaining to the " duties of general ticket agent, general freight agent, general wood agent, telegraph " management, and engine and car repairs.
" They have authority to change, by telegraph or otherwise, the movement of trains " from the times specified in the tables.
" 2. Masters of engine repairs are held responsible for the good condition of the engines " and machinery in shops, and the cost of their repairs.
" It is their duty to make frequent and thorough inspection of the engines, so as to " guard them from accidents and injuries which may result from the want of seasonable " and trifling renewals; also to see that the engines are otherwise in efficient condition " for use. They are also required to report to the Division Superintendents all cases " they may discover of abuse or maltreatment of locomotives by engineers or dis- " patchers.
" There are eight principal engine repair shops on the line, and five shops secondary in " their character, in charge of foremen, which are used only for making such repairs as " are required to enable engines to be run back to the principal shops, where all extensive " repairs are made.
" 3. Car inspectors.—For the more thorough supervision of cars while in transit, the " road is separated into two divisions, and a car inspector appointed for each, whose duty " it is to examine both passenger and freight cars, to see that they are kept in good " condition, having special regard to the reduction of *friction*, making all such trifling " repairs as may be found necessary, and which can be performed, without the aid of the " force employed in shops. Cars are inspected on entering each division by the division " inspectors and their subordinates, who are authorized and required to condemn all cars " which in their judgment are unsafe, and to call the attention of the officers in charge of " general repairs to the fact.
" 4. The general freight agent has the supervision of the freight charges; his duties are, " with the approval of the president or general superintendent, to make and regulate " prices for the transportation of freight, to negotiate contracts and arrangements with indi- " viduals and other companies, and to see that such contracts are fairly and equitably " complied with; also to investigate and examine all claims for damages and losses of " freight or baggage, and certify such of them as are found valid to the general superin- " tendent for approval.
" 5. The general ticket agent is required, with the approval of the president or general " superintendent, to regulate the prices for transportation of passengers, to negotiate " ticket arrangements with other companies, and to supervise all matters connected with " the sale of tickets.
" 6. The general wood agent is required to provide the necessary supply of fuel for " use on the road, to have it delivered in such quantities and of such qualities as shall be " in accordance with the specifications; to see that it is carefully measured before pay- " ment is made, and to submit all contracts to the general superintendent for approval. " At the end of each month it is his duty to furnish an accurate statement of all the fuel " consumed during the month, and at the end of each quarter he is required to make a " correct inventory of all the fuel received during the quarter, the amount paid for the " same, the amount consumed, and the fuel on hand, stating the locality of the same.

" 7. The superintendent of telegraphs is held responsible for the proper working and " economy of the line, and prompt transmission of communications ; he is required to " perfect such arrangements as will enable superintendents of divisions and other officers " of the company to avail themselves, to the fullest extent, of the advantages to be derived " from the use of the telegraph in communicating information or directions in regard to " the movement of trains or business operations of the road, and to see that the instru- " ments, batteries, and other property in his charge are kept in good order and preserva- " tion.

" 8. The foreman of bridge repairs has general charge of all the bridges upon the " road ; he is required to examine them frequently, and is held responsible for their " safety.

" Each officer possesses all the power necessary to render his position efficient, and has " authority, with the approval of the president and general superintendent, to appoint " all persons for whose acts he is held responsible, and may dismiss any subordinate when " in his judgment the interests of the company will be promoted thereby.

" The enforcement of a rigid system of discipline in the government of works of great " magnitude is indispensable to success. All subordinates should be accountable to *and* " *be directed by their immediate superiors only,* as obedience cannot be enforced where " the foreman in immediate charge is interfered with by a superior officer giving orders " directly to his subordinates.

" It is very important, however, that principal officers should be in possession of all " the information necessary to enable them to judge correctly as to the industry and " efficiency of subordinates of every grade."

One peculiar feature of this sub-division of duties, as distinguished from the arrangements adopted on railways in this country, is, that the engines, when not in the shops for repair, are under the sole control of the division superintendent, who is responsible for obtaining a maximum of work from them ; the masters of engine repairs being held responsible for frequently inspecting the engines, and taking care that they are not run when in need of repair.

The object of this organization being to obtain the greatest efficiency and economy in working the trains, the following are the general arrangements by which it is effected :—

1st. The electric telegraph is applied in the manner already described for preventing the delay and danger which would arise from the unpunctuality of a train, upon the movements of which other trains depend ; and for regulating the movements of the cars in accordance with the requirements of the stations ; by which means the rolling stock is utilized to the greatest extent possible.

2nd. The position of the trains is reported hourly by telegraph to the general superintendent's office. When passenger trains are more than ten minutes, and freight trains more than half an hour late, a special report of the cause of delay is made by the conductor at the nearest station, and forwarded to the general superintendent by telegraph. The information thus received, is tabulated on a convenient form, and further inquiries made, if necessary. This close investigation of delays is adopted, because they develop a class of facts and delinquencies which could not easily be detected in any other way ; and when the prevailing causes of delays are known they can be removed.

The speed of freight trains is regulated at the lowest standard consistent with the exigencies of business ; and the speed of the trains between stations is carefully checked in the office, and explanations called for if it has been exceeded. The necessary information is obtained from the daily reports of the conductors, engine-drivers, and station agents.

3rd. The work done by each engine and car is noted every day ; a printed tabular statement, showing the load which each engine is capable of moving under specified circumstances of speed and weather, is furnished to the engine-driver, and the division superintendents are held responsible for seeing that the engines are worked up to their capacity, and that the useful load conveyed in the cars is a maximum.

A monthly statement of the number of miles run by each engine, of the expenses of running, of the cost of repairs, and of the work done by the engine, is printed and circulated amongst the servants of the company.

Each division superintendent furnishes to the general superintendent a monthly account for each train run during the month, showing the number of

miles run by the trains,* and by each class of vehicle, the cost of fuel, oil, &c., the expenses of train attendants, and a proportion of the cost of station expenses, maintenance of way, &c., and all other expenses under the supervision of the division superintendent; as also the receipts from each train.

The returns required are framed with the view of obtaining a comparison between the management in the different divisions, and of the care which is bestowed on the working by the servants, as well as to show whether the receipts from each class of traffic are profitable. (*See* Appendix, Tables, Nos. 7, 8, 9.)

The whole system is based upon a principle which seems to be one well adapted to secure economy and efficiency, viz., the maintenance of rigid discipline, and such a distribution of duties as will secure *personal accountability* through every grade of the service.

The speed of passenger trains in the Eastern States is not very different from that upon English railways, but the number of trains by which passengers can travel is much more limited. In the Western States the speed is generally limited to about twenty or twenty-four miles per hour; certainty of communication being of far more consequence than speed, or frequency, in a new country.

The system which is universally pursued on American railways with respect to passengers' luggage deserves notice.

When the luggage is delivered in charge of the railway servants before the departure of a train, for each package a brass check, stamped with a number, is given to the passenger. A corresponding check, provided with a leather thong, is attached to each package. The baggage master enters upon a printed form, under the head of the destination of the package, the number of the check and the nature of the package. This list is signed by the baggage master or conductor of the train, who, when relieved, receives a receipt for the baggage from his successor. A duplicate list is forwarded to the central office.

The checks are numbered consecutively. A certain number are allotted to each station, and only allowed to be used at that station; so that the number on a check shows the station from which the baggage started.

The baggage is arranged in a systematic manner in the baggage car. It is the sole duty of the man who is responsible for it to look after it, and to enter on the list the delivery of any package, &c.

The baggage is given up to whoever produces the check, and the holder of the check can, if he prefers it, leave his baggage for several days without claiming it. If a check is lost, the passenger is required to pay a small sum to replace it.

It is the practice, on approaching large towns, for a person to walk through the train and collect the checks from passengers who intend to stop. He notes the places to which they wish their baggage to be conveyed, giving a receipt for the check, and receiving a small sum for the delivery of the baggage. This system is very perfect; loss of baggage is very rare under it, and it enables ladies or invalids to obtain their baggage without any trouble or the necessity of looking personally after it, as is the case in England. Each passenger is usually allowed a liberal amount of luggage.

The ticket system for passengers on the United States railways is generally very defective. The conductors issue and collect tickets without there being any check upon them, and the result is great peculation.

As great difficulties are said to exist in framing a proper system of checks, endeavours are being made on all the railways to introduce the system of passengers taking their tickets before entering the cars; at the terminal stations, by not allowing the passengers to go on to the platform until they have taken tickets:—at roadside stations, by allowing a discount of five cents or more on every ticket taken from the station-master. The companies allege that it is impossible to make an inflexible law on the subject, partly because the stations are unfenced, and partly because of the objection of the people to be controlled. The Grand Trunk Railway of Canada has adopted the English ticket system with great success.

* When the amount of traffic renders it necessary to run a special train, the receipts and expenses of the special train are credited to the regular train which it relieves.

It has been already mentioned that the receipts per train are larger on the United Sates railways than on English railways, and in the Western States especially, trains do not appear to be run unless there are passengers to fill them. The comfortable nature of the cars, the facilities with respect to baggage, and the general conveniences in the trains, as well as the protection afforded by the conductor to women travelling alone, make a journey less of a labour than in this country, and it is possible that these causes, combined with lower fares, have assisted to promote the habit of travelling amongst all classes.

It must, however, be acknowledged that the attendance at stations is generally bad; and that some railway companies do not publish time tables, alleging as a reason that publication would render them liable to actions in cases of unpunctuality.*

There is no clearing house for facilitating the traffic arrangements between companies; consequently through passenger tickets over more than one line are issued in the form of coupons.

The superintendents or agents of the companies, on whose lines through tickets are issued, meet periodically to adjust the accounts, generally in accordance with the books of the issuing company.

In the conveyance of through freight, as a general rule, prepayment does not take place, each Company paying the back charges, and the last Company obtaining the amount from the consignee; damage, not traced, being divided according to the mileage of each railway.

The managers of the different railways connected with each other hold a Railway Convention periodically for making arrangements, and revising rates and fares. As a general rule, all fares and rates for goods are published and placarded in conspicuous positions on the railway. Special rates are, however, made when there is competition. The Eastern and Western routes compete very closely for long through traffic; but as a general rule, the competing routes agree to charge equal rates, which are regulated at the Conventions and advertized. The several companies employ agents of their own in all the neighbouring districts where traffic can originate, to collect freight on which these agents take a per-centage. Similarly, passenger tickets are often sold at a considerable discount by the companies to agents, who are frequently shop or hotel keepers, and who use every endeavour to induce the public to buy them.

Companies owning a continuous line of communication make agreements with each other for forwarding traffic; but as far as I could learn, these agreements do not contain clauses, as many agreements between Englisn railway companies do, by which one of the companies binds itself to throw impediments in the way of traffic arriving on to its line by some other route.

On the American railways there is not the same interchange of working stock which takes place on English railways, the distances are so enormous that railway companies are averse to allowing their stock to pass off their lines, except on to lines with which they have special agreements.

This involves an expense of unloading and reloading, which will probably be avoided when the arrangements between the railway companies become more systematised.

This cost is estimated at thirteen or fourteen cents per ton, a cent being equivalent to a halfpenny. For flour and grain, the cost is about ten cents per ton. The grain is emptied into a bin, from which it is raised by means of an endless chain of scoops into a hopper at a considerable height and there weighed, after which it is run down through pipes into the cars or boat in which it is to be carried. Barrels of flour are similarly raised by an endless chain of hooks to a certain height, and then rolled down an inclined plane to their destination.

The conveyance of parcels in the United States is performed by carriers or agencies, termed expresses; these agencies are independent of the railway companies, and make arrangements for the conveyance of parcels over the whole country. These companies contract with the railway company for a compartment of specified dimensions to be furnished to them in such daily number of

* Several railway guides are published, containing time tables of all railways; of these Appleton's is the best. The print is much better than that of Bradshaw, and when the number of trains will admit, one column only is reserved for names of stations, which is placed in the middle of the page, the times of departure of the trains in one direction commencing at the top, and in the other at the bottom of the page. A small diagram of the railway, showing the stations, accompanies each time table, and a general map is appended to the volume.

trains as they require, the weight to be placed in this compartment is limited, any additional weight or space which they require being paid for either as merchandise or under some agreement. Some of the railway companies are beginning to take the parcels traffic on their own lines into their own hands.

The arrangements for the conveyance of mails by railways remain to be described.

These are in a peculiar position, as the railway companies receive their charters from the legislatures of the States in which they are situated; but the Postmaster-General is an officer of the Federal Government, and consequently is not under the same jurisdiction.

The laws of the Federal Government enact, that the Postmaster-General may contract with any railway company for the conveyance of the mails under the following regulations.

He is to classify the railways under three heads, according to the importance of the service required of them, taking into account the size of the mails, and the speed at which they are to be conveyed. A double daily service being usually required.

The first class includes a *heavy* through mail, and for this service the Postmaster-General may pay any sum not exceeding 300 dollars per mile of railway per annum.

The second class includes a *light* through mail. The remuneration for this service may not exceed 100 dollars per mile per annum.

The third class includes a local mail only, and the remuneration for this service is limited to 50 dollars per mile per annum.

If half the service is to be performed at night, an addition of 25 per cent. may be made to the above rates.

In some of the States the local legislatures have inserted clauses in the Railway Companies' charters, requiring them to convey the mails at a rate to be fixed by arbitration, but the Postmaster-General, it is stated, declines to refer any case to arbitration, as the Federal Legislature has vested in him the power of classifying the railways; and a reference to arbitration would virtually set his authority aside.

It appears that, although the Postmaster-General has no power to compel a railway company to carry the mails, except occasionally through the legislature of the State in which the railway is situated, which is a jurisdiction that he does not recognize, still that public opinion acts so strongly upon the companies as to prevent them from refusing, although they almost invariably complain that the remuneration is insufficient. During last autumn one company, the Terre Haute and Alton, an important through line to the West, refused to convey the mails on this account.

Two railway companies only in the United States receive at the present time the full remuneration under the first class. These companies convey a heavy through mail to the West.

The mail contracts are usually entered into for five years, the company being liable to a heavy penalty in case of delay, but they are not answerable for losses.

General Remarks.

There are two distinguishing features of the American system in its relations to the public, which contrast strongly with the system in operation in this country, viz:—

First. That the public are left almost entirely to take care of themselves in trains, at stations, and at level crossings, the only warning of danger being a placarded notice, or the sound of the engine bell.

Secondly. That the conveniences and comfort in the cars are extended equally to all ranks of passengers at a low rate of fare; by which the tendency to travelling is promoted.

These two features are no doubt in some measure due to the habits of the people. Indeed, it is to be borne in mind, that the American Railway System must not be judged by the standard that we have established in England.

In this country, where the space is limited, and where good roads and canals already existed, railways were sought as a means of annihilating distance by high speeds, and of centralizing business into one focus; and were at first scarcely considered as a means of conveyance for the lower classes.

In a new country, where time is not so valuable, high speeds are not required, but a cheap and certain means of locomotion for all classes, and of transporting the produce of the country to a market, is a first necessity. A railway is the best instrument for satisfying this want. Any saving in the cost per mile of a railway adds to the means available for extension; and, in a rapidly developing new country, capital is dear. Hence a rough and ready cheap railway, although it entails increased cost for maintenance, is preferable to a more finished and expensive line. These considerations have influenced the construction of American railways, and the system which has grown up under them is well adapted to the wants of the country.

But this system has not yet attained a fixed position.

As the population and the consequent traffic increases, new capital must be expended in stations, sidings, and additional lines of rails, by which the cost per mile, which now averages from 7,000*l.* to 9,000*l.*, will be increased; the several railways will become more interlaced; a freer interchange of working stock will probably be necessary, possibly involving a resort to an establishment similar to the railway clearing house.

Independently of the conveniences afforded equally to all ranks of passengers, already mentioned, there are, many points in the system, which are worthy of consideration:—

1st. The general system upon which the railway companies are organized is one which appears to afford a good guarantee for efficient management. A railway is managed by a well-paid president, in whom the whole executive power is vested; he is responsible for the efficient and economical working of the line. A body of directors, generally good men of business, unpaid, excepting on peculiar occasions, are appointed to watch over the interests of the shareholders, and to see that the president does *his* duty; and also to take care that the accounts are kept in such a form, and with such checks, that malversation cannot take place. The shareholders have the privilege of electing the president and the directors annually, instead of being compelled to elect them for three years, as is the case in England. They, therefore, possess a direct control over the management of their affairs.

2nd. There are several matters, connected with the construction of railways, which are worthy of notice, viz.:—

The encouragement of the use of rails on roads and streets, to facilitate the distribution of goods traffic, as well as to accommodate local passenger traffic, would prove very useful in many towns, where the streets are broad, instead of throwing every impediment in the way of thus extending the advantages of railways.

The practice of attaching a signal to the lever by which the switches or points are moved, and of habitually locking facing points in position, might be advantageously followed.

The plan of carrying a railway over a hill by zig-zags would afford a comparatively inexpensive means of crossing a steep mountain pass. Each zig-zag terminates in a level space, and the train having been moved forward along one zig-zag on to the level space, is backed up the next, and so on.

The principle of supporting engines and carriages on two independent trucks deserves attention;* the small diameter of wheels may possibly increase the friction, but the cars run safely, and the double springs secure easy motion; it enables very long-bodied cars to be used, which accommodate more passengers with less dead weight than is usually the case in England, especially on narrow gauge lines. The absence of doors renders the amount of attendance on passengers more easy. The conveniences, before described, which are afforded in American cars, are a great comfort on long journeys.

The invariable establishment of a means of communication between the different servants in charge of a train, and the use of breaks to each carriage, might be adopted with advantage. The mode of coupling carriages together by means of a central connexion deserves notice, as being less dangerous for the *employés* than the plan in use on English railways.†

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* Carriages on this principle were in use for a short time on the Waterford and Limerick Railway.

† A central connexion between carriages has been in use on the Dublin and Kingstown Railway.

The protection afforded to the engine driver and fireman against the inclemency of the weather is well worthy of imitation, and would promote safety by enabling the men to keep a better look out. And the use of a bell on the engine, in lieu of the continual use of the steam whistle, to give notice of the approach of a train to stations and at level crossings, presents many advantages, especially in towns.

3rd. Economy and increased efficiency results from the use of the electric telegraph to transmit information of the movements of all the trains on a railway, and to enable a responsible officer, placed in a central position, to control them when they become irregular, as well as to learn each day the positions of all cars on the railway, and the quantity of goods, &c. at each station which requires to be accommodated, and to give orders for the cars to be moved to meet the wants of the traffic.

4th. The detailed organization on the New York and Erie Railway deserves attentive consideration; its main features being a high degree of centralization, and the systematic arrangement of the duties of the officers and servants, so as to enforce a rigid system of personal accountability through every grade of the service.

5th. Those general legislative provisions for securing the public interests, which appear principally to deserve notice, are, that the railway companies shall keep their lines in repair and open for public use, and that they shall supply sufficient accommodation, and transport merchandise and property without partiality, favour, or affection, and with all practicable dispatch. That a railway company is prohibited from exercising the calling of a banker, broker, or dealer in any article whatever. That in some States a government department is empowered to inquire minutely into the causes of railway accidents, to examine witnesses on oath, and to call for all necessary books, papers, &c., and to publish their reports.

6th. But it is with reference to the construction of railways in our own colonies that the American system deserves especial notice. The considerations which led to the adoption of, and the necessities which fostered, that system apply with equal force to railways in the colonies. It appears, therefore, desirable to call attention to some of the deductions which may be drawn from the consideration of this system.

a. A railway would appear to be the best road for arterial lines of communication in a new country.

b. In making railways in a new country, bearing in mind the high rate of interest which money commands, the outlay for construction should be as small as possible consistent with safety and economy of working; the object being to devote the money, to be spent, to extending the mileage and opening out the country, rather than to making very solid works or to obtaining high speeds.

c. Railways made by the States in America have not proved successful, in consequence of the persons selected to manage them being chosen for political considerations.

d. The encouragement given to private companies for the construction of railways in new states, by means of grants of land, has proved very successful. It has facilitated the rapid settlement of the country and the development of its resources. It has directly benefited the State by enhancing the price of the land retained by the State, as well as by the permanent reduction of the general taxation occasioned by the contribution of seven per cent. on the gross receipts of the railway reserved to the State in consideration of the grant of land. But the successful instances of this system are limited to localities where land is of a superior quality, and the climate favourable.

I cannot close this report without expressing to your Lordships how much I am indebted for the information which I have obtained, to the invariable courtesy that I received from every person connected with railways in the United States and Canada, and to the great readiness with which they furnished me with all the particulars in their power.

I have the honour to be, &c.

DOUGLAS GALTON,
Captain, Royal Engineers.

The Lords of the Committee
of Privy Council for Trade and Foreign Plantations.

TABLE showing for the several Railways:—1st. The Amount of Share Capital per Charter. 2nd. The Amount of Capital Stock paid in, the Amount of Funded Debt and Floating Debt, on 30th September 1855. 3rd. The Receipts from Traffic (Earnings) during the Year, and the Working (Transportation) Expenses. 4th. The Interest on the Funded and Floating Debt calculated upon the existing Amount on the 30th September 1855 5th. The proportion per Cent. which the Surplus Income bears to Capital Stock paid in, and the proportion per Cent. which the Net Receipts bear to Total of Capital Stock, Funded and Floating Debt.

Name of Road.	No. of Miles in operation.	Amount of Share Capital per Charter and Acts of Legislature.	Total Capital raised to the 30th Sept. 1855.				Earnings from Passenger Business, Freight Business, and other Business.	Transportation Expenses, viz., on Passenger Business, Freight Business, and other Business.	Interest on Funded Debt and Floating Debt, calculated at the respective Rates of Interest thereon, at 30th Sept. 1855.			Total Transportation Expenses and Interest on Funded Floating Debt.	Amount of Surplus Income.	Proportion per Cent. which the Surplus Income bears to the Capital Stock paid in.	Proportion per Cent. which the Receipts, less Transportation Expenses during the Year, bear to Total Amount of Capital.	Remarks.
			Capital Stock paid in, to 30th Sept. 1855.	Funded Debt.	Floating Debt on the 30th Sept. 1855.	Total.			Interest on the Funded Debt.	Interest on the Floating Debt.	Total.					
	M.	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*			
Albany, Northern	32·70	600,000	439,004	1,550,000	50,000	2,039,004	117,716	107,812	108,500 Calc. at 7 p^{r} cent.	4,457	112,957	220,769	A deficiency of 103,053	—	—	
Troy and Rutland	17·27	325,000	249,939	Ni	30,879	280,818	Leased to Albany, Northern.									
Albany and West Stockbridge	38·00	1,000,000	1,000,000	Nil	930,895	1,930,895	323,318	219,991	Nil.	33,327 Amount paid	33,327	253,318	70,000	7·00	5·31	
Blossburg and Corning	14·81	250,000	250,000	220,000	3,007	473,007	38,293	6,303	15,803	210 Calc. at 7 p^{r} cent.	16,013	22,316	15,977	6·38	6·76	
Black River and Utica	16·0	1,500,000	643,330	132,000	185,859	961,189	26,261	12,401	9,240 Calc. at 7 p^{r} cent.	13,010	22,250	34,651	A deficiency of 8,390	—	—	
Buffalo and New York City	91·0	1,500,000	798,439	1,720,000	867,849	3,386,288	288,392	256,496	120,400	60,748	181,148	437,644	A deficiency of 149,252	—	—	
Buffalo and State Line	69·0	1,300,000	1,300,000	1,000,000	40,000	2,340,000	679,715	323,987	57,597	2,400 Calc. at 6 p^{r} cent.	59,997	383,984	295,731	22·31	15·20	
Buffalo, Corning, and New York	100·0	1,866,600	1,487,874	1,475,000	24,783	2,987,657	172,462	106,143	96,722	1,718 Calc. at 7 p^{r} cent.	98,440	204,583	A deficiency of 32,121	—	—	
Brooklyn City	17·16	2,500,000	902,660	. .	Not stated	902,660	322,117	278,502	. . .	6,780	6,780	285,282	36,835	4·08	4·83	
Canandaigua and Niagara Falls(*a*)	98·57	1,500,000	1,315,000	2,170,000	109,854	3,594,854	59,766	70,839	141,400	7,689	149,089	. .	. . .	. .	. .	(*a*) The receipts being only for four mons. the whole of the figures have been excluded from the totals.
Canandaigua and Elmira	46·84	1,600,000	434,111	800,000	122,393	1,356,504	174,089	104,583	56,900 Calc. at 7 p^{r} cent. includ. Chemung	8,567	65,467	170,050	4,039	0·45	3·84	
Chemung	17·40	380,000	380,000	70,000	. . .	450,000										
Cayuga and Susquehanna	34·61	1,500,000	687,000	500,000	6,686	1,193,686	135,433	86,784	35,000	401	35,401	122,185	13,248	1·93	4·07	
Eighth Avenue	4·89	800,000	762,500	. .	. . .	762,500	215,583	132,592	. . .	. . .	. .	132,592	82,991	10·88	10·88	
Flushing	7·80	200,000	133,131(*b*)	211,000	39,866	383,997	39,432	38,902	14,770 Calc. at 7 p^{r} cent.	3,986 Calc. at 10 p^{r} cent.	18,756	57,658	A deficiency of 18,226	. .	. .	(*b*) Including shares issued for work.
Hudson River	144·0	4,000,000	3,758,466	8,842,000	408,362	13,008,828	1,821,636	1,208,141	618,940	36,752	655,692	1,863,833	A deficiency of 42,197	—	—	
Hudson and Boston	17·0	175,000	175,000	. .	. . .	175,000	For 10 mons. 44,906	34,647	. . .	. . .	. .	34,647	10,259	5·85	5·85	
Long Island	95·0	3,000,000	1,875,148	643,533	25,416 No interest	2,544,097	301,799	185,331	38,557 Calculated	. . .	38,557	223,888	77,911	4·15	4·57	
New York Central	555·88	23,085,600	24,154,860	14,462,742	. . .	38,617,602	6,563,581	3,401,455	839,928 Interest paid	. . .	839,928	4,241,383	2,322,198	9·34	8·19	
New York and Erie	445·0	10,500,000	10,023,958	24,851,000	1,051,540	35,926,498	5,492,180	2,680,327	1,664,889 Interest paid	128,908 Interest paid	1,793,797	4,474,124	1,018,056	10·15	7·82	
New York and New Haven	62·0	3,000,000	3,000,000(*c*)	2,126,000	138,656	5,264,656	925,736	582,852	143,980	9,706 Calc. at 7 p^{r} cent.	153,686	736,538	189,198	6·36	6·51	
New York and Harlem	130·75	8,000,000	5,717,100	3,074,301	995,468	9,786,869	1,184,112	801,451	200,052 Interest paid	97,179 Paid	297,231	1,098,682	85,430	1·49	3·90	(*c*) Including shares issued for work done.
Northern (Ogdensburgh)	118·0	2,000,000	1,633,022	4,173,900	230,374	6,037,296	520,153	375,618	292,173	16,126 Calc. at 7 p^{r} cent.	308,299	683,917	A deficiency of 163,764	—	—	
Niagara Falls and Lake Ontario(*d*)	13·15	200,000	188,620	200,000	30,290	418,910	Not given	. .	14,000 Calc. at 7 p^{r} cent.	2,120 Calc. at 7 p^{r} cent.	16,120	. .	. . .	. .	. .	(*d*) The receipts not being stated, this line has been excluded from the total.
Oswego and Syracuse	35·17	350,000	393,512	196,500	20,181	610,193	126,540	67,558	14,553	18,386	32,939	160,497	26,043	6·62	9·66	
Potsdam and Watertown	29·36	2,000,000	467,200	241,500	52,689	761,389	26,385	26,385	16,905 Calc. at 7 p^{r} cent.	4,215 Calc. at 8 p^{r} cent.	21,120	47,505	A deficiency of 21,120	—	—	
Rensselaer and Saratoga	25·22	610,000	610,000	140,000	None given	750,000	241,149	128,398	9,800	. . .	9,800	148,285	92,864	10·20	9·53	
Saratoga and Schenectady	. .	300,000	300,000	109,000		409,000		2,282	7,805	. . .	7,805					
Rochester and Genesee Valley	18·45	800,000	554,270	150,000	26,118	730,388	42,048	19,256	10,500 Calc. at 7 p^{r} cent.	1,827 Calc. at 7 p^{r} cent.	12,327	31,583	10,465	1·88	3·12	
Syracuse and Binghamton	79·69	1,200,000	768,369	1,375,350	203,454	2,347,173	159,489	136,981	96,274 Calc. at 7 p^{r} cent.	14,231 Calc. at 7 p^{r} cent.	110,505	247,486	A deficiency of 87,997	—	—	
Sacketts Harbour and Ellisburg	18·0	175,000	167,485	250,000	None given	417,485	10,702	7,125	17,500 Calc. at 7 p^{r} cent.	. . .	17,500	24,625	A deficiency of 13,923	—	—	
Saratoga and Whitehall	41·25	500,000	500,000	395,000	None given	895,000	71,909	49,822	27,950 Calc. at 7 p^{r} cent.	. . .	27,950	77,772	A deficiency of 5,863	—	—	
Sixth Avenue	3·75	750,000	750,000	4,491	. . .	754,491	212,456	165,234	313	. . .	313	165,547	46,909	6·20	6·26	
Second Avenue	8·0	800,000	357,600	261,000	109,141	727,741	159,209	155,617	25,032 Calc. at 7 p^{r} cent.	18,270 Calc. at 7 p^{r} cent.	43,302	198,919	A deficiency of 39,710	—	—	
Troy and Boston	27·23	1,000,000	439,492	497,000	236,079	1,172,571	156,362	101,198	34,790	12,524	59,459	160,657	A deficiency of 4,295	—	—	
Troy and Bennington	5·38	80,000	74,100	160,500	13,015	247,615			11,235	910						
Troy and Greenbush	6·0	275,000	275,000	. .	. . .	275,000	85,051	81,664	. . .	. . .	. .	81,664	3,387	1·20	1·20	
Third Avenue	5·75	1,170,000	1,170,000	40,000	. . .	1,210,000	292,475	217,838	2,800	. . .	2,800	220,638	71,837	6·14	6·16	
Watertown and Rome	96·76	1,500,000	1,371,263	545,000	255,979	2,172,242	404,374	231,899	37,380	24,458	61,838	293,737	110,637	8·07	7·94	
Total	2,475·12	80,592,200	68,003,833	70,216,817	6,068,689	144,289,339(*e*)	21,375,063	12,335,575	4,626,288	519,096	5,145,384	17,480,959	3,894,104	5·72	6·26	(*e*) Average per mile 58,295·9 dollars, or 12,144*l.*

Table No. 2.—STATE OF MASSACHUSETTS.

Name of Road.	Capital Stock.	Capital Stock, Funded, Floating Debt, &c., paid in.					Earnings.	Working Expenses and Interest.			Net Earnings.	Proportion per Cent. which the Earnings, less the Working Expenses and Interest on Debt, at the end of the Year, bear to the Capital Stock paid in.	Proportion p Cent. which the Earnings, less the Working Expenses only, bear to the total Capital, Funded, Floating, and Mortgage Debts.	Remarks.
		Capital Stock paid in.	Funded Debt.	Present Amount of Floating Debt.	Present Mortgage Debt.	Total.		Expenses of Working.	Interest on Funded, Floating, and Mortgage Debt.	Total.				
	Dollars.	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*			
Agricultural Branch	580,000	150,000	. .	105,752	7,950	264,010	—	—	—	—	—	—	—	Operated by the Boston and Worcester.
Amherst and Belchertown	400,000	196,050	85,500	4,564	. .	284,114	27,415	22,670	5,403	28,073	A deficiency of 658	—	—	
Berkshire	600,000	600,000	. .	. .	. .	600,000	—	—	—	—	—	—	—	Operated by the Housatonic Company.
Boston and Lowell	1,830,000	1,830,000	145,500	180,135	. .	2,155,635	489,754	349,378	19,538	368,916	120,838	6·60	6·51	
Boston and Maine	4,155,700	4,076,974	150,000	. .	. .	4,226,974	854,425	583,117	7,950	591,067	263,358	6·44	6·41	
Boston and New York Central	2,700,000	2,240,300	374,550	1,144,121	. .	3,758,971	59,917	51,177	91,120	142,297	A deficiency of 82,380	—	—	
Boston and Providence	3,160,000	3,160,000	183,000	176,131	. .	3,519,131	558,671	338,982	24,204	363,186	195,485	6·24	6·24	
Boston and Worcester	4,500,000	4,500,000	500,000	155,428	. .	5,155,428	1,008,005	680,339	39,325	719,664	288,341	6·40	6·35	
Cape Cod	600,000	681,689	199,000	81,597	. .	962,286	119,221	53,693	16,916	70,609	48,612	7·13	6·70	
Cheshire	2,250,000	2,085,925	769,500	129,813	. .	2,985,238	380,221	236,656	60,702	297,358	82,863	3·97	4·89	
Connecticut	1,750,000	1,591,110	235,000	38,240	. .	1,864,350	286,562	192,067	16,391	208,458	78,105	4·90	5·67	
Danvers	100,000	64,880	. .	97,193	. .	162,073	—	—	—	—	—	—	—	Operated by the Boston and Maine.
Dorchester and Milton Branch	130,000	73,340	30,000	10,000	. .	113,340	—	—	—	—	—	—	—	Operated by the Old Colony and Fall River.
Eastern	4,150,000	2,853,400	2,410,000	539,737	. .	5,803,137	647,280	341,283	176,984	518,267	129,013	4·52	5·27	
Easton Branch	50,000	47,920	. .	7,495	. .	55,415	2,908	1,216	447	1,663	1,245	2·51	3·05	
Essex	700,000	299,107	277,961	191,350	. .	768,418	49,356	40,592	28,158	68,750	A deficiency of 19,394	—	—	
Fairhaven	300,000	224,457	. .	197,795	. .	422,252	60,318	26,378	11,868	38,246	22,072	9·83	8·03	
Fitchburg	3,540,000	3,540,000	100,000	53,700	. .	3,693,700	681,162	457,091	10,233	467,324	213,838	6·04	6·07	
Fitchburg and Worcester	500,000	237,220	61,200	15,066	65,200	378,686	37,588	25,428	8,487	33,915	3,673	1·12	3·21	
Grand Junction	1,350,000	774,191	873,000	221,444	See Funded Debt.	1,868,635	63,335	12,158	72,467	84,625	A deficiency of 20,790	—	—	
*Hampshire and Hampden	375,000	291,152	. .	45,914	. .	337,066	—	—	—	—	—	—	—	
*Hartford and New Haven	300,000	. .	939,000	. .	. .	939,000	—	—	—	—	—	—	—	
*Horn Pond Branch	10,000	2,000	. .	. .	. .	2,000	—	—	—	—	—	—	—	
Lexington and West Cambridge	241,200	241,000	. .	. .	. .	241,000	19,693	6,277	. .	6,277	13,416	5·56	5·56	
Lowell and Lawrence	300,000	200,000	100,000	40,000	. .	340,000	50,234	28,273	7,912	36,185	14,049	7·02	6·45	
Marlborough Branch	80,000	56,466	. .	9,952	68,733	135,151	—	—	—	—	—	—	—	Operated by the Fitchburg Company.
Medway Branch	35,000	32,500	. .	6,783	. .	39,283	—	—	—	—	—	—	—	Operated by the Boston and New York Central.
Middleborough and Taunton	150,000	71,620	. .	1,232	. .	72,852	—	—	—	—	—	—	—	
Nashua and Lowell	600,000	600,000	. .	8,000	. .	608,000	196,516	127,860	. .	127,860	68,656	11·44	11·29	
New Bedford and Taunton	500,000	500,000	. .	. .	. .	500,000	169,781	130,418	. .	130,418	39,363	7·87	7·87	
Newburyport	430,000	218,950	137,200	220,677	. .	576,827	50,875	35,093	15,369	50,462	413	—	—	
New London, Willimantic, and Palmer	1,700,000	509,200	1,052,000	21,672	. .	1,582,872	124,043	57,712	66,111	123,823	220	—	—	
New York and Boston in Massachusetts	600,000	223,176	650,000	27,853	. .	901,029	15,985	11,180	47,456	58,636	A deficiency of 42,651	—	—	
Norwich and Worcester	2,825,000	2,122,300	779,887	93,601	. .	2,995,788	304,236	215,778	42,546	258,324	45,912	2·16	2·95	
Old Colony and Fall River	3,300,000	3,015,100	276,700	15,950	. .	3,307,750	653,499	357,762	19,371	377,133	276,366	9·19	8·94	
Peterborough and Shirley	275,000	262,500	45,000	5,600	. .	313,100	—	—	—	—	—	—	—	Operated by the Fitchburg Company.
Pittsfield and North Adams	500,000	450,000	. .	. .	. .	450,000	54,842	29,230	. .	29,230	25,612	5·60	5·60	
*Providence, Warren, and Bristol	292,000	276,600	113,500	12,000	113,500	515,600	—	—	—	—	—	—	—	
Providence and Worcester	1,550,000	1,510,200	300,000	38,461	. .	1,848,661	311,429	199,902	23,692	223,594	87,835	5·81	6·03	
Salem and Lowell	400,000	243,305	81,500	60,757	. .	385,562	66,883	12,412	7,096	19,508	47,375	—	—	Operated by the Lowell and Lawrence Company.
Saugus Branch	160,000	126,550	. .	. .	. .	126,550	12,632	11,131	. .	11,131	1,501	1·18	1·18	
South Reading Branch	400,000	209,532	. .	84,150	. .	293,682	13,560	22,355	. .	22,355	A deficiency of 8,794	—	—	
South Shore	600,000	259,685	184,470	5,184	. .	449,339	65,310	48,924	11,454	60,378	4,932	1·89	3·67	
Stockbridge and Pittsfield	448,700	448,700	. .	. .	. .	448,700	—	—	—	—	—	—	—	Operated by the Housatonic Company.
Stoneham Branch	100,000	33,316	. .	. .	. .	33,316	—	—	—	—	—	—	—	
Stoney Brook	267,300	267,300	. .	. .	. .	267,300	42,271	26,459	. .	26,459	15,812	5·91	5·91	
Stoughton Branch	85,400	85,400	. .	. .	. .	85,400	33,554	29,615	. .	29,615	3,939	4·61	4·61	
Taunton Branch	250,000	250,000	. .	. .	. .	250,000	151,368	126,174	. .	126,174	25,194	10·07	10·07	
Vermont and Massachusetts	3,200,000	2,232,540	956,000	76,770	. .	3,266,210	268,726	181,413	63,419	244,832	23,894	1·07	2·67	
Western	6,150,000	5,150,000	5,824,520	141,900	. .	11,116,420	1,869,673	1,236,659	297,860	1,534,519	335,154	6·51	5·69	
West Stockbridge	39,600	39,600	. .	. .	. .	39,600	—	—	—	—	—	—	—	Leased to the Berkshire.
Worcester and Nashua	2,100,000	1,141,000	200,000	5,565	. .	1,346,565	204,780	116,902	12,118	129,020	75,760	6·64	6·52	
Total	60,632,900	49,724,811	16,982,388	4,213,668	141,883	71,062,750†	10,006,528	6,423,754	1,204,597	7,628,351	2,378,174	4·78	5·04	

* This line is not included in the Total.

† Average per mile 4,8721·2 dollars, or 10,150*l.*

Table No. 3.—RAILWAYS IN THE STATES OF ILLINOIS, MICHIGAN, OHIO, PENNSYLVANIA, &c.

Table showing for several of the Railways:—1st. The Amount of Capital Stock, Bonded and Floating Debt, on the 30th September 1855. 2nd. The Receipts from Traffic (Earnings). 3rd. The Working Expenses during the Year; the Amount of Interest on the Bonded and Floating Debt, calculated upon the existing Amount on the 30th September 1855. 4th. The Proportion per cent. which the Surplus Income bears to Capital Stock; and the Proportion per cent. which the Earnings, less Working Expenses, bear to total Amount of Capital Stock, Bonded and Floating Debt.

—	Length.	Amount of Capital Stock, Bonds, and Floating Debt.				Earnings.	Working Expenses and Interest.			Net Earnings.	Proportion per Cent. which the Earnings, less the Working Expenses and Interest on Debt at the end of the Year, bear to the Capital Stock paid in.	Proportion per Cent. which the Earnings, less the Working Expenses, bear to the Total Amount of Capital Stock, Bonds, and Floating Debt.
		Capital Stock.	Bonds.	Floating Debt.	Total.		Expenses of Working, &c.	Interest on Bonds and Floating Debt.	Total.			
State of Illinois, Michigan, Ohio, &c.	Miles.	Dollars.	Dollars.	Dollars.	Dollars.	Dollars.	Dollars.	Dollars.	Dollars.	Dollars.		
Illinois Central	529	2,571,050	*19,068,567	2,558,703	24,198,320	1,532,118	969,895	1,297,632	2,267,527	A deficiency of 735,409	—	—
Chicago, Burlington, and Quincy	58	1,476,442	1,240,000	356,577	3,073,019	722,618	344,759	77,740	420,499	302,119	20·46	12·36
Galena and Chicago	232	5,441,500	2,834,330	470,952	8,746,782	2,315,786	1,063,744	174,505	1,238,249	1,077,737	19·80	14·31
Central Military Tract	79	1,262,500	1,854,000	251,331	3,367,831	451,895	247,115	126,318	373,433	78,462	5·74	6·08
Michigan Central	269	6,033,432	5,408,063	1,098,760	12,540,255	2,878,321	1,571,817	423,368	1,995,185	883,136	14·63	10·42
Baltimore and Ohio	386	13,118,902	9,494,506	480,484	23,093,892	4,114,089	2,305,634	598,499	2,904,133	1,209,956	9·22	7·83
States of Pennsylvania, New Hampshire, &c.												
Pennsylvania	353	12,355,525	6,376,041	. .	18,731,566	4,270,015	2,440,738	382,560	2,823,298	1,446,717	11·71	9·77
Philadelphia and Reading	98	10,830,360	6,934,000	504,800	18,269,160	4,321,793	1,727,878	446,328	2,174,206	2,147,587	19·83	14·19
Manchester and Lawrence	26	800,000	. .	171,916	971,916	188,697	169,390	12,012	121,402	67,295	8·41	8·86
Total	2,030	53,889,711	53,209,507	5,893,523	112,992,417†	20,359,384	10,773,970	3,538,962	14,317,932	6,477,400	12·02	8·86
Cleveland, Columbus, and Cincinnati	141	4,547,020	98,400	. .	4,645,020	1,264,187	—	—	—	—	—	—
Cleveland and Toledo	200	3,323,172	3,370,277	335,473	7,029,462	869,553	—	—	—	—	—	—
Chicago and Rock Island	229	4,029,000	1,971,000	. .	6,000,000	1,313,386	—	—	—	—	—	—
Cincinnati, Hamilton, and Dayton	60	2,153,900	1,011,000	435,912	3,600,812	468,884	—	—	—	—	—	—
Michigan, Southern and Northern Indiana	338	6,928,900	5,800,000	344,454	13,073,354	2,784,297	—	—	—	—	—	—
Covington and Lexington	90	1,308,800	1,966,000	470,000	3,744,300	275,846	—	—	—	—	—	—
Indianopolis and Cincinnati	90	1,303,675	1,397,800	269,480	2,960,955	402,488	—	—	—	—	—	—
Little Miami and Columbus and Xenia	138	4,465,877	896,000	261,786	5,623,633	1,007,906	—	—	—	—	—	—
Concord	35	No Account.		. .	. .	335,948	199,494	—	—	—	—	—
Milwaukie and Mississippi	103	1,826,438	2,750,000	. .	4,576,438	670,993	—	—	—	—	—	—
Macon and Western	102	1,353,754	129,000	. .	1,482,754	349,948	—	—	—	—	—	—
Total	1,526	31,140,536	19,389,477	2,117,105	52,736,728	9,543,436	—	—	—	—	—	—
Grand Total	3,556	85,030,247	72,598,984	8,010,628	165 729,469	30,002,820	—	—	—	—	—	—

* In the amount of Construction Bonds issued, 3,000,000 dollars of Free Land Bonds are included.

† Average per mile 62,180 dollars, or 12,955*l*.

Table No. 4.—RAILWAYS IN THE STATE OF NEW YORK.

Table showing the Receipts and Expenditure of Railway Companies reduced to a Mileage Rate for the Year ended September 1855.

Name of Railway.	Length of Line open.	Earnings per Mile of Road.				Number of Miles travelled by Passengers per Mile of Line open.	Mileage travelled by Trains per Mile of Line open.			Payments per Mile of Road.				Payments per Mile of Road.				Average Cost in Pence per Mile run by Trains, Passenger and Freight Transportation.				Payments per Mile run by Trains.			Earnings per Mile run by Trains.			Percentage of Transportation Payments to the Earnings.
		From Passengers.	From Freight.	From other Business.	Total.		Passenger Trains.	Freight Trains.	Total.	From Passengers.	From Freight.	From other Business.	Total.	Maintenance of Way.	Repairs of Machinery.	Expense of operating the Road.	Total.	Maintenance of Way.	Repairs of Machinery.	Expense of operating the Road.	Total.	Passenger.	Freight.	Total.	Passenger.	Freight.	Total.	
	Miles.	£	£	£	£					£	£	£	£	£	£	£	£	d.	d.	d.	d.	d.	d.	d	d.	d.	d	
Albany, Northern (including Troy and Rutland).	49·97	284·31	184·46	22·01	490·78	103975·53	3258·93	566·51	3825·44	328·80	120·74	. .	449·44	97·27	88·75	263·42	449·44	9·32	8·51	25·26	43·09	37·00	78·00	43·00	32·00	119·50	47·00	91·58
Albany and West Stockbridge.	38·00	722·91	1014·22	35·44	1772·57	150869·89	2190·68	4773·63	6964·31	351·04	855·05	. .	1206·09	453·22	194·76	558·11	1206·09	15·62	6·71	49·28	41·61	38·50	43·00	41·61	79·00	51·00	61·00	68·04
Blossburg and Corning	14·81	68·14	466·12	4·41	538·67	16354·28	634·03	850·77	1484·80	. .	. .	. .	88·67	. .	. .	. .	88·67	10·75	Own none.	3·58	14·33	. .	. .	. .	26·00	101·50	87·00	—
Black River and Utica	16·00	241·83	96·19	3·93	341·95	51791·81	1212·37	60·56	1272·93	107·33	54·15	. .	161·48	51·96	6·02	103·50	161·48	9·79	1·13	19·50	30·42	21·00	714·50	30·42	48·00	381·00	64·50	47·22
Buffalo and New York City.	91·00	283·39	348·68	17·46	649·53	67292·15	2608·00	834·00	3442·00	. .	. .	. .	587·21	210·93	132·99	243·29	587·21	14·71	9·27	16·96	40·94	27·00	83·00	40·94	26·50	102·00	40·00	61·54
Buffalo and State Line	69·00	1199·70	811·02	41·66	2052·38	252706·21	2965·83	2192·88	5158·71	558·64	419·58	. .	978·22	286·07	138·76	553·39	978·22	13·31	6·46	25·74	45·51	45·00	46·00	45·51	97·00	89·00	95·50	47·66
Buffalo, Corning, and New York.	100·00	175·05	162·66	21·61	359·32	39441·84	1138·92	615·68	1754·60	115·99	106·14	. .	221·13	46·89	51·27	122·97	221·13	6·41	7·01	16·82	30·24	24·00	41·50	30·24	37·00	63·50	49·00	61·54
Brooklyn City	17·16	3838·06	. .	72·64	3910·70	. .	. .	. .	. .	. .	. .	639·51	. .	173·25	121·96	3085·72	3380·93	. .	. .	. .	. .	. .	. .	. .	9·00	. .	9·50	—
Canandaigua and Niagara Falls.	98·57	95·14	23·65	5·46	124·25	16540·02	339·73	134·05	473·78	91·81	45·91	9·55	147·27	32·56	44·49	70·55	147·60	16·49	22·54	35·73	74·76	66·00	83·50	74·76	68·50	43·00	62·50	120·54
Canandaigua and Elmira (including Cheming).	64·24	332·99	169·17	27·38	529·54	73433·04	1132·63	810·36	2242·99	183·86	134·26	. .	318·12	81·14	68·16	184·66	333·96	7·20	9·60	19·20	36·00	33·00	42·50	36·00	59·00	53·00	60·00	60·07
Cayuga and Susquehanna	54·61	117·03	638·29	59·91	815·23	20210·14	615·80	1835·68	2451·48	94·47	401·54	26·38	522·39	186·63	72·43	236·95	496·01	18·27	7·09	23·20	48·56	37·00	52·50	48·56	45·50	83·50	79·50	64·07
Eighth Avenue	4·89	9932·74	. .	. .	9932·74	. .	. .	. .	. .	5648·86	. .	. .	5648·86	328·79	299·79	5022·28	5648·86	. .	. .	. .	. .	11·00	. .	11·00	16·50	. .	16·50	61·50
Flushing	7·80	787·84	47·62	13·78	849·24	204455·13	3852·30	24·11	3876·41	549·27	19·96	. .	569·23	78·21	50·89	440·13	569·23	4·84	3·17	27·29	35·30	34·00	199·50	35·30	61·50	474·00	67·00	98·65
Hudson River	144·00	1686·07	785·72	44·99	2516·78	518688·01	3774·57	2353·78	6128·35	1033·63	644·34	. .	1677·97	186·49	285·74	1241·69	1713·92	7·31	11·19	48·62	67·12	68·50	68·50	67·12	111·50	83·50	103·00	66·66
Hudson and Boston	17·00	121·69	428·23	. .	549·92	20703·88	964·70	1800·00	2764·70	70·76	353·84	. .	424·60	130·47	69·47	224·65	424·59	11·52	6·03	19·50	36·85	17·50	47·00	36·85	30·50	57·00	47·50	77·21
Long Island (including Hicksville and Cold Spring Branch).	95·00	387·88	212·61	18·95	619·44	99779·11	1496·94	863·72	2360·66	207·62	172·78	. .	380·40	81·55	72·77	252·11	406·43	8·29	7·39	25·63	41·31	35·50	51·50	41·31	66·50	63·00	67·50	61·44
New York Central	555·88	1215·19	1195·47	49·38	2460·04	304116·43	3492·69	6135·09	9627·78	607·67	577·13	19·44	1274·87	313·46	291·65	669·41	1274·52	12·48	11·61	26·64	50·73	47·50	54·50	50·73	83·50	113·00	93·00	51·82
New York and Erie (including Union).	464·00	716 38	1540·57	59·25	2316·20	188922·24	3291·77	3767·41	7059·18	323·37	611·73	. .	954·54	248·32	181·13	769·83	1179·28	9·31	6·16	27·19	42·66	31·00	51·00	42·66	58·00	109·00	87·00	48·83
New York and New Haven	62·00	2468·93	509·38	166·93	3145·24	665299·77	6248·96	1308·45	7557·41	. .	. .	. .	1950·62	297·66	355·71	1343·79	1997·16	9·31	11·75	41·14	62·20	. .	. .	62·20	95·00	93·50	99·00	1·30
New York and Harlem	132·88	821·62	665·98	136·01	1623·61	152948·37	2737·04	1436·33	4173·37	. .	. .	24·98	1256·59	234·55	183·66	838·35	1256·59	14·09	10·58	48·76	73·43	. .	. .	73·43	73·00	113·00	95·00	77·38
Northern Ogdensburgh	121·75	196·96	608·76	84·84	890·06	31859·22	998·83	1644·39	2643·22	632·78	. .	. .	657·76	245·79	152·65	260·32	657·76	22·27	14·31	23·64	60·22	40·50	72·00	60·22	49·00	91·50	83·50	73·91
Niagara Falls and Lake Ontario.	13·50	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	72·24	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Oswego and Syracuse	35·17	421·62	302·32	25·63	749·57	67043·53	1422·09	855·84	2277·93	173·89	154·05	. .	327·95	94·19	70·63	163·13	327·95	9·92	7·41	17·19	34·55	29·50	43·00	34·55	71·00	84·50	79·00	53·39
Ogdensburgh, Clayton, and Rome.	. .	. .	. .	. .	. .	. .	Mixed . .	. .	. .	. .	. .	2·71	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Potsdam and Watertown	29·36	79·37	105·06	2·79	187·22	10475·06	1060·79	. .	1060·79	79·37	105·00	. .	187·08	. .	. .	. .	. .	42·22	. .	6·24	48·49	. .	. .	. .	. .	. .	57·50	—
Rensselaer and Saratoga, (including Saratoga and Schenectady).	46·22	631·51	296·39	136·04	1063·94	177749·24	2473·90	1212·85	3686·75	366·63	199·86	. .	566·49	192·83	96·37	289·52	578·72	23·01	11·48	34·56	69·05	66·50	84·00	69·05	114·50	109·50	129·50	52·24
Rochester and Genesee Valley.	18·45	345·45	124·82	4·53	474·80	59680·27	1193·06	551·22	1744·28	160·91	56·53	. .	217·44	46·19	50·36	120·88	217·43	6·35	6·94	16·63	29·92	32·50	24·50	29·92	69·50	54·50	65·50	45·79
Syracuse and Binghamton	79·69	237·81	167·00	12·14	416·95	34435·06	1471·70	785·54	2257·24	195·98	162·13	. .	358·11	97·21	55·18	171·79	324·18	10·34	9·47	18·26	38·07	32·00	49·00	38·07	38·50	51·00	44·50	85·88
Sackett's Harbour and Ellisburg.	18·00	49·51	59·26	15·09	123·86	8410·39	1183·11	591·55	1774·66	. .	. .	. .	82·47	52·28	17·61	68·94	138·83	7·07	0·56	11·15	18·72	. .	. .	18·72	10·00	24·00	16·50	66·58
Saratoga and Whitehall	47·87	196·97	66·04	10·56	273·57	38769·55	440·58	273·57	714·15	. .	. .	. .	189·55	94·70	27·89	94·01	216·60	39·21	11·06	34·29	84·56	. .	. .	84·56	142·00	77·00	122·00	69·29
Saratoga and Schenectady	21·00	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	13·90	. .	8·76	22·66	—	—	—	—	—	—	—	—	—	—	—
Sixth Avenue	3·75	11403·11	. .	. .	. .	. .	. .	. .	. .	9179·72	. .	. .	9179·72	658·13	546·66	7974·94	9179·73	. .	. .	. .	. .	9·50	. .	. .	12·00	. .	12·00	77·77
Second Avenue	8·00	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	455·88	110·87	3485·75	4052·50	—	—	—	—	—	—	—	—	—	—	—
Troy and Boston	27·23	435·34	472·60	32·77	940·71	88397·83	1948·33	855·25	2803·58	243·49	132·32	206·95	612·76	99·04	91·01	322·58	512·63	8·45	8·09	29·14	45·68	37·50	57·00	45·68	67·50	167·00	101·50	65·13
Troy and Bennington	5·38	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Troy and Greenbush	6·00	1025·24	1701·04	109·10	2835·38	248043·83	78617·66	1962·00	80579·66	1305·73	300·69	1029·74	2835·56	648·00	381·67	1965·16	2835·56	15·69	9·24	47·58	72·51	39·50	61·00	72·51	30·50	208·00	68·50	100·00
Troy Union	2·01	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Third Avenue	5·75	10287·08	. .	84·39	10371·47	. .	. .	. .	. .	7724·77	. .	242·48	7967·25	814·60	583·65	6494·00	7967·25	. .	. .	. .	. .	11·50	. .	11·50	15·50	. .	16·00	74·48
Watertown and Rome	96·76	334·51	501·28	34·86	870·65	59982·83	1563·41	1025·92	2589·33	112·04	448·18	. .	560·22	103·21	105·44	289·41	493·06	9·59	10·67	28·20	48·46	15·50	93·50	48·46	51·50	117·50	80·50	57·35
Totals, excluding City Roads	2616·45	742·18	780·84	53·75	1576·87	171516·36	2359·83	1790·10	4149·93	423·12	461·96	35·97	892·66	201·69	169·09	521·88	892·66	11·30	9·15	29·15	49·60	42·00	54·50	49·60	72·50	101·50	88·00	56·72

Table No. 5.—STATE OF MASSACHUSETTS.

Table showing the Receipts and Expenditure of Railway Companies reduced to a Mileage Rate for the Year ended September 1855.

Name of Railway.	Length of Line open.	Earnings per Mile of Road.				Number of Miles travelled by Passengers per Mile of Line open.	Mileage travelled by Trains per Mile of Line open.			Payments per Mile of Road.				Payments per Mile run by Trains, Passenger and Freight Transportation.				Earnings per Mile run by Trains.			Per centage of Transportation Payments to the Earnings.
		From Passengers.	From Freight.	From other Business.	Total.		Passenger Trains.	Freight Trains.	Total.	Maintenance of Way.	Repairs of Machinery.	Expense of operating the Road.	Total.	Maintenance of Way.	Repairs of Machinery.	Expense of operating the Road.	Total.	Passenger.	Freight.	Total.	
	Miles.	£	£	£	£					£	£	£	£	*d.*	*d.*	*d.*	*d.*	*d.*	*d.*	*d.*	
Amherst and Belchertown	19·50	141·32	138·38	8·62	288·32	15259·15		1222·56	1222·56	16·92	91·38	75·18	213·48	9·12	17·76	14·88	41·76	—	—	—	74·04
Berkshire	21·20	Leased to Housatonic Railroad Co.				61738·02	622·64	753·63	1376·27	—	—	—	—	—	—	—	—	—	—	—	—
Boston and Lowell	27·62	1468·85	2152·16	73·13	3694·14	360342·97	5708·47	4990·91	10699·38	700·10	1001·94	897·34	2599·38	15·60	22·32	20·16	58·08	61·68	103·44	83·04	70·36
Boston and Maine	92·25	1221·12	640·09	17·96	1879·17	415331·92	4386·44	1933·51	6319·95	319·68	371·38	131·46	822·52	12·00	14·16	5·04	31·20	66·72	79·44	71·28	43·77
Boston and New York Central	78·10	89·91	64·49	5·43	159·83	35964·82	544·02	191·44	735·46	. .	63·18	67·97	131·15	. .	20·64	22·08	42·72	39·60	80·88	52·08	82·05
Boston and Providence	59·28	1119·45	796·48	20·09	1936·02	270065·67	3510·29	1870·64	5380·93	318·53	587·12	368·56	1274·21	14·16	26·16	16·32	56·64	76·32	102·24	86·16	65·81
Boston and Worcester	68·62	1606·63	1350·90	65·43	3023·04	503645·74	4080·92	2909·60	7890·52	376·88	753·39	702·09	1832·36	11·52	22·80	21·36	55·68	77·28	111·36	91·92	60·61
Cape Cod	47·14	395·23	109·16	21·32	525·71	87269·71	1836·57	545·95	2382·52	90·66	113·87	107·50	312·03	9·12	11·28	10·80	31·20	51·60	47·76	53·04	59·35
Cheshire	53·64	526·35	899·01	24·84	1450·20	115482·98	1505·48	4868·79	5874·27	223·22	270·22	274·23	767 67	9·12	11·04	11·04	31·20	83·76	49·44	59·04	52·94
Connecticut River	52·35	568·79	515·94	43·62	1128·35	105017·68	1817·38	1438·15	3255·53	226·62	201·16	217·16	644·94	16·56	14·88	16·08	47·52	75·12	86·16	83·04	57·16
Danvers		Operated by the Boston and Maine.																			
Dorchester and Milton Branch		Operated by the Old Colony and Fall River.																			
Eastern	60·07	1605·50	372·59	96·87	2074·96	305854·30	4202·64	1060·98	5263·62	238·53	472·88	453·15	1164·54	10·80	21·36	20·88	53·04	91·68	84·24	94·56	56·12
Eastern Branch		Operated by the Boston and Providence.																			
Essex	23·22	200·31	149·26	11·65	361·22	27790·18	1773·64	604·65	2378·29	117·14	128·21	326·57	571·92	11·76	12·96	32·88	57·60	27·12	59·28	36·48	158·33
Fairhaven Branch	15·11	479·33	167·73	13·09	660·15	84360·16	2638·65	633·35	3272·00	13·43	162·80	243·42	419·65	·96	12·00	17·76	30·72	43·68	63·60	48·48	63·56
Fitchburg	92·39	668·71	840·57	17·67	1526·95	197413·64	2404·86	2486·83	4891·69	308·35	329·68	350·11	988·14	15·12	16·08	17·28	44·48	66·72	81·12	74·88	64·71
Fitchburg and Worcester	13·99	233·77	221·46	10·41	465·64	62220·51	1870·76	760·54	2631·30	93·78	110·72	174·12	378·62	8·40	10·08	15·84	34·32	30·00	69·84	42·48	81·31
Grand Junction Railroad and Depôt Company.	9·00	1·96	972·05	. .	974·01	7000·00	9·77	1001·67	1011·44	32·00	32·33	222·67	287·00	7·44	7·68	52·80	67·92	48·24	233·76	231·12	29·46
Lexington and West Cambridge		Operated by the Fitchburg.																			
Lowell and Lawrence	12·35	557·29	194·15	11·81	763·25	111062·43	2543·96	245·02	2788·98	103·48	231·74	107·85	443·07	8·88	19·92	9·12	37·92	52·56	190·08	65·76	58·05
Marlborough Branch		Operated by the Fitchburg.																			
Medway Branch		Operated by the Boston and New York Central.																			
Nashua and Lowell	14·58	1104·38	1593·80	38·64	2736·82	296345·34	3316·94	3830·86	7147·80	211·94	555·48	579·69	1347·11	6·96	18·48	19·68	45·12	79·92	99·84	91·92	49·22
New Bedford, near Tauntou	21·59	1003·56	506·85	20·26	1530·67	183609·91	2321·45	612·59	2934·04	87·86	307·88	299·81	695·55	6·96	25·20	24·72	56·88	103·68	198·48	125·04	45·44
Newburyport	26·98	290·22	91·46	11·17	392·85	64666·38	2356·71	462·56	2819·27	·22	127·66	143·29	271·17	. .	10·80	12·24	23·04	29·52	47·52	33·36	69·02
New London, Willimantic, and Palmer	66·00	183·39	175·64	26·87	385·90	. .	1314·59	520·54	1835·13	41·91	51·76	92·63	186·30	5·52	6·72	12·00	24·24	33·12	80·88	50·40	48·28
New York and Boston in Massachusetts	8·06	287·93	112·33	12·92	413·18	84797·52	2549·87	95·29	2645·16	. .	. .	. .	. .	. .	. .	. .	. .	27·12	280·80	37 44	—
Norwich and Worcester	66·00	397·73	491·13	18·93	907·79	72314·61	1884·51	2142·06	4026·57	121·16	349·57	160·39	631·12	7·20	20·88	9·36	37·44	50·64	54·96	54·24	69·52
Old Colony and Fall River	90·49	964·49	500·12	23·64	1488·25	188017·64	3196·75	1313·21	4509·96	228·58	311·09	266·42	806·09	12·00	16·56	14·16	42·72	72·24	91·44	78·96	54·16
Peterborough and Shirley		Operated by the Fitchburg Company.																			
Pittsfield and North Adams	18·65	250·66	340·74	21 ·23	612·63	65697·10	1689·54	. .	1689·54	87·03	121·77	117·69	326·49	12·24	17·52	16·56	46·32	55·52	. .	. .	53·29
Providence, Warren and Bristol	13·60	199·53	16·88	1·62	218·03	30439·56	640·07	. .	640·07	43·89	66 Furnished by the Boston and Providence.	92·07	136·62	16·56	·24	34·32	51·12	74·88	. .	. .	62·67
Providence and Worcester	43·41	680·02	784·62	15·43	1480·07	146597·39	2618·43	1900·87	4519·30	166·20	338·30	454·84	959·34	8·64	18·00	24·24	50·88	62·16	98·88	78·48	64·81
Salem and Lowell	16·88	336·73	481·62	6·23	824·58	72894·25	2911·91	962·79	3874·70	. .	. .	. .	. .	. .	. .	. .	. .	27·84	120·00	50·88	—
Sangus Branch	8·40	313·31	. .	. .	313·31	48779·04	228·57	. .	228·57	5·59	70·83	141·43	217·85	·72	7·44	14·64	22·80	32·88	. .	32·88	69·55
South Reading Branch	8·15	247·24	90·31	. .	337·55	68319·63	3071·41	689·08	3760·49	. .	. .	. .	. .	. .	. .	. .	. .	19·44	31·44	22·36	—
South Shore	11·50	1121·34	42·03	16·55	1179·92	148636·09	2101·39	. .	2101·39	86·17	162·87	207·05	456·09	10·08	18·48	23·52	52·08	Mixed 132·72	. .	132·72	38·65
Stony Brook	13·16	357·33	297·34	14·31	669·18	63292·02	2430·54	1117·94	3548·48	75·33	175·68	125·31	374·32	5·04	11·76	8·40	25·20	35·28	63·60	45·12	55·93
Stoughton Branch	4·04	999·36	699·01	10·31	1708·68	111330·19	1235·64	3·96	1239·60	. .	230·19	14·11	244·30	. .	44·40	2·88	47·28	Mixed 328·80	. .	. .	14·30
Taunton Branch	11·10	1747·21	1051·17	22·52	2820·90	298385·31	2564·68	867·21	3431·89	215·14	336·66	368·83	920·63	15·36	23·52	25·68	64·56	163·44	290·88	197·28	32·64
Vermont and Massachusetts	69·00	235·93	404·69	33·96	674·58	53870·34	718·69	1249·00	1967·69	197·87	159·81	187·71	545·39	24·24	19·44	22·80	66·48	78·72	77·76	82·08	80·85
Western	155·40	1022·95	1351·34	35·53	2409·82	309198·47	2148·94	4425·25	6574·19	532·93	662·97	435·39	1631·29	19·44	24·24	15·84	59·52	114·24	73·20	87·84	67·69
Worcester and Nashua	45·74	469·64	430·13	15·79	915·56	71536·25	2068·97	1593·77	3662·74	99·35	218·95	214·12	532·42	6·48	14·16	14·16	34·80	54·48	64·56	59·76	58·15
Total	1458·56	732·13	637·92	2· 57	1397·62*	189594·78†	2428·22	1841·02	4269·24	229·65	340·29	287·71	857·65‡	12·48	18·96	16·08	47·52‖	71·28	81·84	77·28§	60·55¶

* Exclusive of the "Berkshire" Railway. † Exclusive of the "New London, Willimantic, and Palmer" Railway. ‡ Exclusive of the "Berkshire," "New York and Boston in Massachusetts," "Salem and Lowell," and "South Reading Branch" Railways. ‖ Exclusive of the "Berkshire," "New York and Boston in Massachusetts," "Salem and Lowell," and "South Reading Branch" Railways. § Exclusive of the "Berkshire" and "Boston and Lowell" Railways. ¶ Exclusive of the "New York and Boston in Massachusetts," "Salem and Lowell," and "South Reading Branch" Railways.

Table No. 6.—RAILWAYS IN THE STATES OF ILLINOIS, MICHIGAN, PENNSYLVANIA, &c.

Table showing the Receipts and Expenditure of Railway Companies reduced to a Mileage Rate, for the Year ended September 1855.

—	Length.	Earnings per Mile of Road.				Number of Miles travelled by Passengers, per Mile of Line opened.	Mileage travelled by Trains, per Mile of Line open.				Payments per Mile of Road.				Payments per Mile run by Trains.				Earnings per Mile run by Trains.				Per Centage of Transportation Payment to Earnings.
		From Passengers.	From Freight.	Other Business.	Total.		Passenger.	Freight.	Other Trains.	Total.	Maintenance of Way.	Repairs of Machinery, Coaches, &c.	Expenses of operating the Road.	Total.	Maintenance of Way.	Repairs of Machinery, Coaches, &c.	Expenses of operating the Road.	Total.	Passenger.	Freight.	Other Trains.	Total.	
State of Illinois, Michigan, Ohio, &c.	Miles.	£	£	£	£						£	£	£	£	*d.*	*d.*	*d.*	*d.*	*d.*	*d.*	*d.*	*d.*	
Illinois, Central	529	291·15	248·47	63·75	603·37		1,148	653	235	2,036	154·69	157·95	69·70	382·34	18·23	18·62	8·17	45·02	60·88	91·25	65·10	171·12	64
Chicago, Burlington, and Quincy	58				2595·60									1231·17									47
Galena and Chicago Union	232	817·66	1261·88		2079·54	13,272				3,991	176·63	487·25	418·21	955·20	10·62	29·29	17·40	57·31				125·04	45
Central Military Tract	79	443·67	698·14		1191·71						106·33	165·92	379·27	651·52									54
Michigan, Central	269	1212·30	946·69	70·92	2229·91		2,982	2,310	562	5,854	282·06	517·06	418·21	1217·33	11·54	21·23	17·12	49·89	97·32	98·33	49·99	91·27	54
Michigan, Southern, and Indiana.	338	No Account.			—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Baltimore and Ohio	386	492·21	1702·53		2194·64	83,925	2,146	6,669		8,815	412·43	335·82	538·48	1286·73	11·19	7·96	14·62	33·77	54·36	62·19		60·27	55
States of Pennsylvania, New Hampshire, &c.																							
Concord	35	756·05	1234·51		1990·56	132,947	2,182	4,048		6,232	360·43	492·05	394·94	1187·42	11·56	18·95	15·21	45·72	83·12	73·16		76·67	59
Pennsylvania	353	804·74	1655·63		2460·37		1,927	3,352		5,279	132·82	414·90	889·28	1437·00	6·19	18·86	40·41	65·46	100·19	118·51		111·82	58
Philadelphia and Reading	98	672·13	8515·34		9187·47	104,975				17,719	444·95	1036·75	2190·57	3672·27	6·02	14·04	29·68	49·74				124·43	39
Manchester and Lawrence	26	623·76	867·23		1490·99					4,847	154·92	220·92	429·34	805·18	7·67	10·78	21·25	39·70				73·82	54
Total	2,403	642·95	1437·89	26·21	2048·36					5,440	231·23	353·78	487·44	1047·18	10·18	15·79	21·47	47·44				90·74	52
		Exclusive of C. B. and Q.									Exclusive of C. B. and Q.												

Table No. 7.

Form used on New York and Erie Railroad for Monthly Report of Division Superintendent of Employés on the Union Railroad Division, during the Month of July 1856.

This report must be made to the Auditor promptly at the close of each month, and must embrace *all* employés.

Nature of Employment.	Whole Number employed.	Average Number employed.	Aggregate Time employed.	Average Rate per Day.	Total Amount.	Average Number last Month.	Average Number this Month.	Difference More.	Difference Less.	Amount More.	Amount Less.	Remarks.
			Days.	Dols. C.	Dols. C.					Dols. C.	Dols. C.	
Division Superintendents	1	1	31	3 33	100 0	1	1	—	—	—	—	
Agents	12	12	372	1 41	524 33	12	12	—	—	5 17	—	
Clerks	8	8	215	1 81[2]	386 67	8	8	—	—	—	14 99	
Milk Agents and Collectors	4	4	124	1 33[2]	165 58	4	4	—	—	—	6 92	
Baggagemen	12	12	332	1 44[1]	479 21	12	12	—	—	19 15	—	
Tallymen	2	2	45	1 42[3]	64 22	2	2	—	—	—	16 55	
Switchmen	10	10	290	1 06[3]	307 21	8	10	2	—	52 98	—	
Train Despatchers	7	6	187	1 14	213 22	6	6	—	—	—	23 36	
Flagmen	1	1	26	1 0	26 0	2	1	—	1	—	30 0	
Porters	2	2	62	1 12[2]	69 75	2	2	—	—	2 25	—	
Pumping Water	4	3	89	1 0	89 0	4	3	—	1	—	31 0	
Labourers at Stations	31	30	792[1]	1 11	880 96	30	30	—	—	10 18	—	
Watchmen at Stations	4	4	115	1 10	126 29	5	4	—	1	—	29 61	
Conductors	16	13	347	2 13[1]	740 57	12	13	1	—	21 69	—	
Telegraph Operators, &c.	—	—	—	—	—	—	—	—	—	—	—	
Brakemen	56	52	1,341	1 15[2]	1,547 29	48	52	4	—	105 36	—	
Oilmen	11	10	270	1 15[2]	311 54	8	10	2	—	61 56	—	
Wood Agents	—	—	—	—	—	—	—	—	—	—	—	
Foremen, Wood Department	—	—	—	—	—	—	—	—	—	—	—	
Labourers „	—	—	—	—	—	—	—	—	—	—	—	
Enginemen	31	29	753	2 81[1]	2,118 26	24	29	5	—	600 30	—	
Firemen	30	29	762[2]	1 14[2]	870 79	27	29	2	—	49 94	—	
Wipers	11	11	333[2]	1 03[2]	344 97	11	11	—	—	6 37	—	
Masons	2	2	49	2 0	98 25	2	2	—	—	—	3 31	
Blacksmiths	1	1	10	1 75	17 50	—	1	1	—	17 50	—	
Helpers	1	1	10	1 0	10 0	—	1	1	—	10 0	—	
Spring Makers	—	—	—	—	—	—	—	—	—	—	—	
Boiler Makers	—	—	—	—	—	—	—	—	—	—	—	
Copersmiths	—	—	—	—	—	—	—	—	—	—	—	
Carpenters	33	16	428	1 70[3]	730 91	18	16	—	2	—	109 23	
Car Builders	—	—	—	—	—	—	—	—	—	—	—	
Car Repairers	—	—	—	—	—	—	—	—	—	—	—	
Pattern Makers	—	—	—	—	—	—	—	—	—	—	—	
Painters	—	—	—	—	—	—	—	—	—	—	—	
Time Keepers	—	—	—	—	—	—	—	—	—	—	—	
Watchmen in Shops	—	—	—	—	—	—	—	—	—	—	—	
Labourers in Shops	—	—	—	—	—	—	—	—	—	—	—	
Supervisors, Track	1	1	26	2 50	65 0	1	1	—	—	—	—	
Foremen, Track	10	9	236	1 35	318 11	9	9	—	—	—	16 89	
Trackmen	74	55	1,426[1]	1 0	1,420 25	54	55	1	—	15 0	—	
Bridge Watch	1	1	31	1 13	35 0	1	1	—	—	—	—	
Bridge Carpenters	24	15	384	2 10[2]	808 0	25	15	—	10	—	446 49	
Labourers, on Fences	—	—	—	—	—	—	—	—	—	—	—	
Conductors, Gravel Trains	1	1	25[2]	3 50	89 25	2	1	—	1	—	26 0	
Foremen „	6	6	157	1 72	270 0	7	6	—	1	—	35 21	
Flagmen „	1	1	22[2]	1 25	28 12	2	1	—	1	—	20 41	
Oilmen „	1	1	22[2]	1 0	22 50	2	1	—	1	—	13 37	
Labourers „	185	138	3,596[3]	1 01	3,662 70	161	138	—	23	—	589 98	
Totals	594	487	12,909[3]	1 31[1]	16,911 54	510	487	19	42	977 45	1,473 32	

I certify the above statement to be correct.

(Signed) ——— Superintendent, U.R.

Table No. 8.

Form used on the New York and Erie Railroad for the Statement of Miles run, Quantity and Cost of Materials used, and Labour performed by each Engine, during the Month of April 1856; for the information of Employés.

Length, 124¾ Miles. — EASTERN DIVISION, UNION RAILROAD, AND NEWBURGH BRANCH. — Maximum Grade, 60 feet to 1 Mile.

No. of Engine.	Miles run.	Cost for Engineer and Fireman.	Oil, Waste, and Tallow: Gallons of Oil used.	Miles run to one pint of Oil.	Pounds of Waste used.	Pounds of Tallow used.	Cost for Oil, Waste, and Tallow.	Cost per Mile run for Oil, Waste, and Tallow.	Repairs of Engines: Cost for Repairs of Engine.	Cost per Mile run for Repairs of Engine.	Fuel: Cords of Fuel used.	Cost of Fuel.	Cost per Mile run for Fuel.	Total: Total Cost.	Total Cost per Mile run.	Tonnage: Passenger: Cars carried One Mile.	Cost per Car per Mile.	Useful Load: Tons carried One Mile.	Cost per Ton per Mile.	Useful Load and Dead Weight: Tons carried One Mile.	Cost per Ton per Mile.
		Dolls. c.					*Dolls. c.*	*Cents.*	*Dolls. c.*	*Cents.*		*Dolls. c.*	*Cents.*	*Dolls. c.*	*Cents.*		*Cents.*		*Mills.*		*Mills.*
109	2,290	127 14	21½	13 31/100	33	58	34 40	1 50/100	18 96	82/100	87½	494 38	21 58/100	674 88	29 47/100	20,763	3 25/100	—	—	—	—
110	3,115	116 63	17	22 90/100	56	67	31 05	1	25 24	81/100	67	378 55	12 15/100	551 47	17 70/100	10,496	- -	- - -	- -	1,029	—
142	1,860	104 12	18	12 93/100	27	26	25 93	1 30/100	49 95	2 20/100	69	389 85	29 90/100	560 85	30 15/100	15,194	3 68/100	—	—	—	—
143	- - -	- - -	- -	- -	- -	- -	- - -	- -	344 87	- -	- -	- - -	- -	344 87	—	—	—	—	—	—	—
144	2,018	113 41	17½	14 43/100	68	51	31 76	1 57/100	8 21	48/100	60½	341 82	17	495 20	24 53/100	616	- -	51,621	- -	98,396	1
146	1,309	74 34	13¼	12 35/100	43	55	25 42	1 94/100	47 67	3 64/100	56½	319 23	24 38/100	466 66	30 05/100	- - -	- - -	133,429	3 5/100	246,681	1 7/100
147	616	40 77	9	8 55/100	20	14	13 61	2 20/100	72 59	11 78/100	35	197 75	32 10/100	324 72	52 71/100	- - -	- - -	72,858	4 4/100	127,248	2 5/100
148	2,156	123 88	21	12 83/100	51	27	31 39	1 45/100	13 69	6 35/100	101	570 65	26 40/100	739 61	34 30/100	- - -	- - -	230,326	3 2/100	418,014	1 9/100
149	616	45 54	8	9 62/100	13	20	12 66	2 5/100	143 95	23 37/100	35	197 75	32 10/100	399 90	65	- - -	- - -	56,200	7 1/100	104,547	3 1/100
201	2,301	112 38	11	26 24/100	55	28	20 44	88/100	21 57	93/100	55½	313 58	13 62/100	467 97	20 33/100	16,480	2 84/100	—	—	—	—
202	2,587	135 27	12½	25 87/100	38	56	24 29	94/100	23 86	92/100	57½	324 87	12 55/100	508 29	19 64/100	1,882	- -	4,438	- -	24,238	1
203	2,488	121 79	13	23 92/100	46	51	24 87	99/100	3 94	15/100	55	310 75	12 45/100	461 35	14 52/100	11,326	4 7/100	—	—	—	—
204	758	52 17	14½	6 53/100	17	20	20 39	2 68/100	267 94	35 34/100	16	90 40	11 99/100	430 90	56 84/100	3,696	11 85/100	—	—	—	—
205	2,513	146 37	28½	11 2/100	57	- -	37 15	1 47/100	82 19	3 27/100	54	305 10	12 14/100	570 81	22 73/100	12,117	7 71/100	—	—	—	—

Length, 104 Miles. — DELAWARE DIVISION. (Similar table to the above.) — Maximum Grade, 60 feet to 1 Mile.

Length, 139¾ Miles. — SUSQUEHANNA DIVISION. (Similar table to the above.) — Maximum Grade, 12 feet to 1 Mile.

Length, 127¾ Miles. — WESTERN DIVISION. (Similar table to the above.) — Maximum Grade, 52 feet to 1 Mile.

Length, 91 Miles. — BUFFALO DIVISION. (Similar table to the above.) — Maximum Grade, 51 feet to 1 Mile.

Recapitulation.

Divisions.	Miles run.	Cost for Engineers and Firemen.	Cost per Mile run for Engineers and Firemen.	Oil, Waste, and Tallow: Gallons of Oil used.	Miles run to one Pint of Oil.	Pounds of Waste used.	Pounds of Tallow used.	Cost for Oil, Waste, and Tallow.	Cost per Mile run for Oil, Waste, and Tallow.	Repairs of Engines: Cost for Repairs of Engines.	Cost per Mile run for Repairs of Engines.	Fuel: Cords of Fuel used.	Miles run to one Cord of Fuel.	Cost of Fuel per Cord.	Cost of Fuel.	Cost per Mile run for Fuel.	Total: Total Cost.	Total Cost per Mile run.	Tonnage: Passenger Cars carried One Mile.	Cost per Car per Mile for Fuel.	Tons of Useful Load carried One Mile.	Tons of Useful Load and Dead Weight carried One Mile.	Cost per Ton per Mile for Fuel.
		Dolls. c.	*Cents.*					*Dolls. c.*	*Cents.*	*Dolls. c.*	*Cents.*			*d. c.*	*Dolls. c.*	*Cents.*	*Dolls. c.*	*Cents.*		*Cents.*			*Mills.*
Eastern Division Union Railroad and Newburgh Branch	77,022	4,752 01	6 15/100	758¾	12 68/100	1,880	1,734	1,229 36	1 50/100	9,554 35	12 40/100	2,709½	24 74/100	5 65	15,308 67	19 87/100	30,844 39	40 1/100	145,005	3 7/100	3,210,264	5,966,974	1 1/100
Delaware Division	51,087	2,840 26	5 55/100	457¾	13 95/100	1,100½	680	756 11	1 48/100	8,884 31	17 39/100	2,081½	24 53/100	4 03	8,388 44	16 43/100	20,869 12	40 85/100	100,772	2 4/100	4,401,714	8,048,996	78/100
Susquehanna Division	66,937	3,235 39	4 83/100	529¾	15 79/100	1,286	1,710	938 63	1 40/100	5,465 30	8 16/100	3,045	21 98/100	2 82	8,586 90	12 82/100	18,226 22	27 21/100	139,803	1 74/100	5,420,308	10,156,889	66/100
Western Division	59,742	2,920 46	4 88/100	611½	12 31/100	1,204	1,733	1,105 59	1 85/100	6,510 55	10 89/100	2,419	24 69/100	2 44	5,902 36	9 88/100	16,438 96	27 50/100	74,686	1 60/100	2,917,669	5,578,796	80/100
Buffalo Division	26,804	1,563 31	5 83/100	410½	8 16/100	650½	60	548 74	2 4/100	2,560 83	9 55/100	1,211	22 13/100	2 99	3,620 89	13 50/100	8,293 77	30 94/100	52,388	2 50/100	674,322	1,395,024	1 85/100
Totals	281,592	15,311 43	- -	2,768¾	- -	6,121	5,917	4,578 43	- -	32,975 34	- -	11,466	- -	- -	41,807 26	- -	94,672 46	- -	512,654	- -	16,624.277	31,146,679	- -
General Average	- -	- - -	5 43/100	- -	12 71/100	- -	- -	- - -	1 62/100	- - -	11 71/100	- -	24 55/100	3 64	- - -	14 84/100	- - -	33 58/100	- -	2 28/100	- - -	- - -	96/100
General Average last month	- -	- - -	5 90/100	- -	12 1/100	- -	- -	- - -	1 88/100	- - -	14 81/100	- -	22 29/100	3 73	- - -	16 02/100	- - -	33 96/100	- -	2 06/100	- - -	- - -	1 55/100

Divisions.	No. and Kind of Engine.	Engineers.	Miles run.	Cost for Engineer and Fireman.	Gallons of Oil used.	Miles run to One Pint of Oil.	Pounds of Waste used.	Pounds of Tallow used.	Cost for Oil, Waste, and Tallow.	Cost per Mile run for Oil, Waste, and Tallow.	Cost for Repairs of Engines.	Cost per Mile run for Repairs of Engine.	Cords of Fuel used.	Cost of Fuel.	Cost per Mile run for Fuel.	Total Cost.	Total Cost per Mile run.
				Dolls. c.					*Dolls. c.*	*Cents.*	*Dolls. c.*	*Cents.*		*Dolls. c.*	*Cents.*	*Dolls. c.*	*Cents.*
Eastern Division Union Railroad and Newburgh Branch	203 Passenger	Garrett Iserman	2,488	121 79	13	23 92/100	46	51	24 87	99/100	3 94	15/100	55	310 75	12 45/100	461 35	14 52/100
	109 Freight	William H. Adams	2,290	127 14	21½	13 31/100	33	58	34 40	1 50/100	18 96	82/100	87½	494 38	21 58/100	674 88	29 47/100
Delaware Division	56 Passenger	Samuel H. Wood	2,704	112 38	10¼	33	50½	- -	16 85	62/100	25 11	93/100	52½	211 57	7 82/100	366 91	13 56/100
Susquehanna Division	181 Freight	Lamb and Winfield	2,502	107 80	21½	14 54/100	48	46	37 69	1 50/100	35 73	1 42/100	134½	542 03	21 66/100	723 25	28 89/100
	94 Passenger	Thomas Tennant	2,508	124 17	14½	21 07/100	20	36	23 15	92/100	35 29	1 40/100	31	87 42	3 48/100	270 03	10 76/100
Western Division	61 Freight	Edward P. Gould	1,966	82 85	9¼	26 96/100	38	48	18 49	93/100	25 18	1 28/100	101½	286 23	14 53/100	412 75	21 00/100
	99 Passenger	Cole and Robinson	3,250	105 30	16½	24 03/100	29	25	29 25	90/100	18 94	58/100	91	222 04	6 83/100	375 53	11 55/100
Buffalo Division	126 Freight	Davis and others	2,850	205 62	49	7 27/100	43	76	64 09	2 24/100	21 87	76/100	52	126 88	4 45/100	418 46	14 68/100
	2 Passenger	C. T. M'Elvainey	4,538	189 00	54	10 50/100	38	6	66 81	1 47/100	61 16	1 35/100	109½	327 40	7 21/100	644 37	14 19/100
	10 Freight	John Quine and others'	2,517	121 12	33¾	9 29/100	46	2½	44 49	1 76/100	14 73	68/100	124	370 76	14 72/100	551 10	21 89/100

TABLE No. 9.

AN EXHIBIT OF THE SEVERAL TRAINS RUN UPON THE_____DIVISION OF THE NEW YORK AND ERIE RAILROAD IN THE MONTH OF_____185__, SHOWING THE SERVICE PERFORMED, THE EXPENSES, THE RECEIPTS, AND THE NET REVENUE.

NAMES OF TRAINS.	SERVICE PERFORMED. Miles Run: By Trains.	Locomotives.	Passenger Cars.	Baggage Cars.	Express Cars.	Mail Cars.	Freight Cars.	Caboose Cars.	Coal Cars.	Gravel Cars.	Passengers. Number of. Way.	Through.	Total.	Per Mile run. Per Passenger Car.	Freight. Number of Tons. Way.	Through.	Total.	Per Mile run. Per Train.	Per Car.
EASTWARD TRAINS.																			
Total Eastward Trains - -																			
WESTWARD TRAINS.																			
Total Westward Trains - -																			
Total all Trains																			

NAMES OF TRAINS.	RUNNING EXPENSES. Fuel. Per Month.	Per Mile. Per Train.	Per Car.	Oil, Tallow, and Waste. For Engines. Per Month.	Per Mile. Per Train.	Per Car.	For Cars. Per Month.	Per Mile. Per Train.	Per Car.	Engineers and Firemen. Per Month.	Per Mile. Per Train.	Per Car.	STATION EXPENSES. Conductors and Brakemen, &c. Per Month.	Per Mile. Per Train.	Per Car.	Total Running Expenses. Per Month.	Per Mile. Per Train.	Per Car.	Per Month per Train. Office Expenses, Stationery, &c.	Agents and Clerks.	Labour, Loading and Unloading.	Porters, Watchmen, and Switchmen.	Wood, Water, and Station attendance.	Total Station Expenses. Per Month.	Per Mile. Per Train.	Per Car.
EASTWARD TRAINS.																											
Total Eastward Trains - -																											
WESTWARD TRAINS.																											
Total Westward Trains - -																											
Total all Trains																											

NAMES OF TRAINS.	REPAIRS OF ENGINES AND CARS. Engines, Machinery in Shops, &c. Engines and Tenders per Month.	Machinery in Shops.	Incidental Expenses per Month.	Total. Per Month.	Per Train.	Per Mile. Per Car.	Cars. Passenger. Per Month.	Per Train.	Per Car.	Baggage, Mail, and Express. Per Month per Train. Baggage.	Express.	Mail.	Total.	Per Train.	Per Car.	Freight. Per Month.	Per Train.	Per Car.	REPAIRS OF ROADWAY AND STRUCTURES. Road. Roadbed.	Track.	Trust Bridges.	Total. Per Month.	Per Train.	Per Car.	Buildings, &c. Fences, Gates, &c.	Freight and Passenger Stations.	Engine and Car Houses, Machine and Work-shops.	Dwelling Houses, &c.	Telegraph.	Total. Per Month.	Per Mile. Per Car.
EASTWARD TRAINS.																															
Total Eastward Trains - -																															
WESTWARD TRAINS.																															
Total Westward Trains - -																															
Total all Trains																															

NAMES OF TRAINS.	GENERAL AND INCIDENTAL EXPENSES. Damages and Losses. Of Baggage and Goods.	To Persons for Injuries.	To Property along Line.	Superintendence. General.	Contingencies. Division and Office Expenses.	General.	Total. Of Division. Per Month.	Per Mile. Per Train.	Per Car.	TOTAL EXPENSES. Per Train per Month.	Per Mile. Per Train.	Per Car.	Per Passenger.	Per Ton.	TOTAL EARNINGS. Passenger Train Earnings. Per Month. Way.	Through.	Total.	Per Mile. Per Train.	Per Car.	Per Passenger.	Freight Train Earnings. Per Month. Way.	Through.	Total.	Per Mile. Per Train.	Per Car.	Per Ton.	NET EARNINGS. Per Train per Month.	Per Mile. Per Train.	Per Car.	Per Passenger.	Per Ton.
EASTWARD TRAINS.																															
Total Eastward Trains - -																															
WESTWARD TRAINS.																															
Total Westward Trains - -																															
Total all Trains																															

NEW YORK AND ERIE RAILROAD COMPANY. BUFFALO DIVISION. TRANSPORTATION DISBURSEMENTS.

DATE.	TO WHOM.	FOR WHAT.	No. of Voucher.	TOTAL AMOUNT.	EXPENSES OF OPERATING THE ROAD. Office and Station Expenses. Office Expenses and Stationery.	Agents and Clerks.	Labour Loading and Unloading.	Cost of Running. Porters, Watchmen, and Switchmen.	Wood and Water Stations Attendance.	Fuel, First Cost and Labour.	Conductors, Bag'n and B'emen. Passenger.	Freight.	Enginemen and Firemen. Passenger.	Freight.	Oil and Waste for Engines. Passenger.	Freight.	Oil and Waste for Cars. Passenger.	Freight.	GENERAL EXPENSES. Loss and Damage on Goods and Baggage.	Damages for Injuries to Persons.	Damages to Property.	General Superintendence.	Contingencies.	EXPENSES OF REPAIRS OF MACHINERY. Repairs of Engines, Cars, &c. Engines and Tenders. Passenger.	Freight.	Passenger and Baggage Cars.	Freight Cars.	Tools and Machinery in Shops.	Incidental Expenses about Shops.	EXPENSES OF MAINTAINING ROAD AND UCTURES. Repairs of Track and Roadway. Roadbed.	Track.	Fences, Gates, &c.	Repairs of Structures. Trust Bridges.	Passenger, Wood and Water Stations.	Engine and Car Houses and M. and W. S.	Boats. (Dwellings.)	Incidental. Superintendence and Office Expenses.	Taxes.	Contingencies.	Ferry.	Expenses Operating Telegraph.	Freight Earnings Refunded.	Passenger Earnings Refunded.

FORM used on the NEW YORK AND ERIE RAILROAD to show RATES of POWER of ENGINES on Delaware Division for Gross Weight of Cars and Load, going Eastward. (Susquehanna to Deposit.)

Grade, 60 feet to the mile.

No. of Engine.	Gross Weight in Tons. Max.	Mean.	Min.
12	296	222	148
14	200	150	100
18	250	187	125
24	230	172	115

FORM used for RETURN of _____Superintendent of the _____Division of the NEW YORK AND ERIE RAILWAY, for the Month of_____185 .

Showing the Number of Trains run on the Division; the Number of Miles run on each Train by Locomotives, and by the several Classes of Cars; the Quantity of Fuel and Oil consumed for each Train; the Cost of Train Attendants, Station Expenses, Repairs of Road and Buildings, pro rata, and of all other Expenditures under the Supervision of the Division Superintendent.

NAMES OF TRAINS.	MILES RUN. By Trains.	Locomotives.	Passenger Cars.	Baggage Cars.	Express Cars.	Mail Cars.	Freight Cars.	FUEL. Wood, Cords.	Coal, Tons.	OIL, &c. Engine, Galls.	Car, Galls.	Waste and Tallow.	TRAIN ATTENDANTS. Engineer and Firemen.	Conductors, Watchmen &c.	STATION EXPENSES. Office Expenses and Stationery.	Agents and Clerks.	Loading and Unloading.	Porters, Watchmen, and Switchmen.	W. and W. Station Attendants.	REPAIRS OF ROAD AND BUILDINGS. Roadbed.	Track.	Fences and Gates.	Trust Bridges.	Wood and Passenger Stations, &c.	Engine and Car Houses, Machine and Work-shops.	Dwelling Houses.	MISCELLANEOUS. Div. Superintendence and Office Expenses.	Contingencies.
												Dollars.	Dollars.	Dollars.	Dollars.	Dollars.	Dollars.	Dollars.	Dollars.	Dollars.	Dollars.	Dollars.	Dollars.	Dollars.	Dollars.	Dollars.	Dollars.	Dollars.
EASTWARD TRAINS.																												
Total Eastward Trains - -																												
WESTWARD TRAINS.																												
Total Westward Trains - -																												
Total all Trains																												

E 2

TABLE No. 8

Description of the Iron Suspension and Trussed Bridge at Harper's Ferry.

[*Extracted from an Account of it by* Wendel Bollman, Master of Track Repairs on the Baltimore and Ohio Railway, *by whom it was designed.*]

The span of the Iron Suspension and Trussed Bridge, erected at Harper's Ferry, is 124 feet between abutments. The length of cast iron in stretcher, 128 feet. The weight of cast iron in the R. R. truss, 65,137 lbs.; of wrought iron, 33,527 lbs; making a total weight of cast and wrought iron, 98,664 lbs.

The wrought iron requires little workmanship; the rods from the centre to abutments having but an eye at one and a screw at the other, end; with a weld or two between according to length. The long counter rods have two knuckles and one swivel for adjustment of strain, and convenience in welding, as well as in raising the whole.

The cast iron stretcher is octagonal without, circular within, and averages one inch of metal. It is cast in lengths according to the length of panel, and jointed in the simplest manner;—at one end of each length is a tenon, at the other a socket. The latter is bored out, and the tenon and its shoulder turned off in a lathe to fit the socket; thus, when thoroughly joined, to form one continuous pipe between abutments. The ends of the sections of cylinders, inserted to those contiguous, are slightly rounded, to allow a small angular movement without risk of joint fracture.

A cast iron plate or washer sets on a bracket cast with each abutment end of stretcher, and at right angles to the centre acting rods. The tension bars are passed through this washer to receive a screw nut for the erection and adjustment of the system.

The stretcher or straining beam, the vertical posts, and suspension bars compose the essential features of the bridge;—each post being hung by two bars from both ends of the stretcher independently of all the others; and each post and pair of tension bars forming with the stretcher a separate truss.

This system, perfect in itself, is additionally connected by diagonal rods in each panel; also by light hollow castings, acting as struts. The diagonal side rods might be safely dispensed with, for the peculiar merit of the truss is its perfect independence of such provision. They are therefore used as a safeguard only in case of the fracture of any of the principal suspension rods.

By this combination of cast and wrought iron, the former is in a state of compression, the latter in that of tension; the proper condition of the two metals. It unites the principles of the Suspension and of the Truss Bridges. *Each* bar performs its own part in supporting the load in proportion to its distance from the abutment; so that the entire series of suspending rods transmits the same tension to the points of support as would be equally transmitted from thence to the centre of bridge.

The tensile resistance of the best American bar iron tables at 80,000 lbs. per square inch. Its practical value is generally rated at about one-fourth the nominal value. In this diagram the highest given value of iron is 16,000; being reduced below any probable rate of fibral separation in any previous data.

Now to proceed for proportion of one rib; that is,

One-half Weight of Bridge and Load.

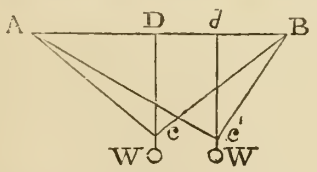
Weight of Iron	- - -	24,000 lbs.
,, Timber	- - -	15,000 ,,
,, Load	- - -	184,000 ,,
,, Momentum	- - -	25,000 ,,
		248,000 ,, The total weight to be sustained by one rib.

This, when distributed, is carried at eight different points; at the centre by two equal, and on either side by two unequal forces. Therefore, $\frac{248,000}{8} = 31,000$ lbs. on each post; or, in other words, there is a concentration of 31,000 lbs. on each floor beam at the points of suspension.

The distance from centre of abutment to centre of bridge = 64 feet; so that $\frac{31,000 \times 64}{128} = 15,500$ lbs. weight, on acting rods at the centre, the forces being equal.

The distance from centre of abutment, or the point of support, to the centre of post, or internal line of first or abutment panel = 17.5; therefore, applying the principles of the lever, as before mentioned, we have transferred to the farthest point of support $\frac{31,000 \times 17.5}{128} = 4,238$ lbs. as the weight; which deducted from 31,000 lbs., leaves 26,761.8 lbs., as the weight transferred to the nearest point of support.

To use further plainness in application of first principles, let us take the following diagram:—



A D = ½ A B = 6

A d = ¾ A B = 9

B d = ¼ A B = 3

W = 144

In the triangle A B C, A C = C B. Then the weight being between the fulcrum and power, A B : A D or D B : : W : A C or B C 12 : 6 : : 144 : 72 lbs., or $\frac{144 \times 6}{12} = 72$ lbs., weight on A C or B C, the forces being equal.

B d = 3. Then A B : B d : : W : A c', or 12 : 3 : : 144 : 36 lbs., or $\frac{144 \times 3}{12} = 36 - 144 = 108$ lbs. on B c', or by proportion A B : A d : : W or 12 : 9 : : 144 : 108 lbs. on B c', the forces being unequal.

The sum of resistances of the extended fibres should equal the sum of resistances of the compressed fibres.

This bridge, it will be seen, is composed of seven independent trusses, which transfer the weight concentrated on each floor-beam directly to the abutments, without aid from any other connection; and not from panel to panel as in general use.

The strain on cast and wrought iron is wholly in direct line; and the result, the least quantity of metal is required to carry a given weight. The weight of bridge and load has a vertical pressure on the piers, towers, &c., the only horizontal thrust being from the expansion of iron, which is accommodated by rollers, sliding of abutment bracket over its pedestal, or by other means: the necessary dimensions of masonry may therefore be most moderate.

It is evident, from an inspection of the drawing, that no chord is requisite at the bottom of the truss to resist tension; the only advantage of that employed is to regulate the movement produced by expansion, in the performance of which agency the resistance is one to compression.

Although the abutment bracket casting and its pedestal were so constructed as to admit of accommodation to expansion, by rollers, yet such contrivance was omitted with the view of fully testing the effect of greatest expansion throughout the system.

It is now ten months since this bridge was erected at Harper's Ferry; during which time it has been exposed to extremes of cold and heat, and to an average run of twenty trains daily.

From the closest inspection we find that the extreme expansion measures, as near as possible, five-sixteenths of an inch on each tower, or five-eighths in the entire length, 128 feet of stretcher; and without the slightest perceptible derangement of masonry; the dimensions of which are 4 feet square of base, 12 feet high, and 2 feet 9 inches at top.

While on the subject of expansion it may be well to notice the effect from difference in expansion of the rods. At the first point of suspension, or where the longest and shortest rods meet, the counter rod is about four and a half times longer than the acting rod; and the expansion of the counter is four and a half times that of the acting rod. But there is also a proportionate difference in the lengths of stretcher from the point directly over the centre of connexion to the extremities of these rods. This has been practically proved in this bridge.

The suspender bolt, when the expansion is extreme or five-eighths of an inch in the length of stretcher, exhibits a motive difference of three-sixteenths towards the short or acting rod; which difference is provided for, as seen by slot-dotted in Elevation, where the vertical suspender bolt moves to accommodate any such difference, and to give that proportion of weight to each rod according to the angle.

It affords easy access for repairs; for instance, should a new floor beam be required, it is but needed to slacken the horizontal rod and the keys in longitudinal strut, remove the washer under point of suspension, and let down the beam to be replaced; which can be done without trestling up any part of the bridge.

In case of fire, the floor may be entirely consumed without any injury to the side truss.

The permanent principle in bridge building, sustained throughout this mode of structure, and in which there is such gain in competition with every other, viz., the direct transfer of weight to the abutments, renders the calculation simple, the expense certain, and facilitates the erection of secure, economical, and durable structures.

PARTICULARS of a TRIAL made on the 1st day of June 1852, to prove the STIFFNESS of an IRON BRIDGE erected by WENDEL BOLLMAN, at HARPER'S FERRY.

Three first-class tonnage engines, with three tenders, were first carefully weighed, and then run upon the bridge, at the same time nearly covering its whole length, and weighing in the aggregate 273,550 lbs., or 136 $\frac{1,550}{2,000}$ tons nett, being over a ton for each foot in length of the bridge.

This burden was tried at about eight miles per hour, and the deflections, according to gauges properly set and reliable in their action, were at centre post, $1\frac{3}{8}''$, and at the first post from abutment nine-sixteenths of an inch.

From this test it is found, that the load did not cover the entire length of bridge by about 13 feet, yet the excess of weight in the middle, and at a speed of about eight miles per hour, produced no greater deflection than $1\frac{3}{8}$ of an inch at the centre post, and nine-sixteenths of an inch at the first point from abutment.

W. BOLLMAN.

LIST OF PLATES.

No. 1. Showing the mode of forming joints of rails, and of connecting the cars, &c. &c.

No. 2. Sketch of an iron truss and suspension bridge at Harper's Ferry.

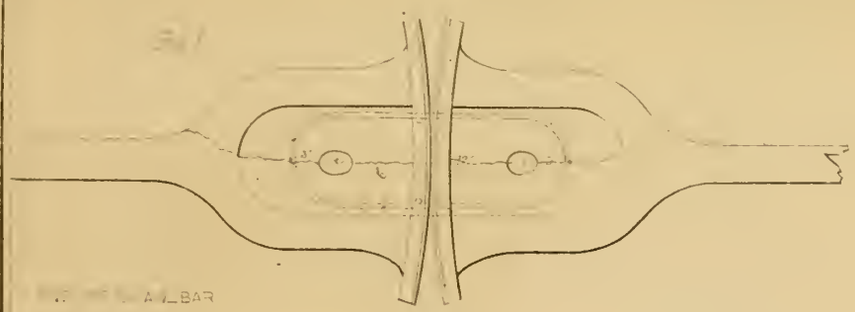
No. 3. Sketch of a timber bridge over the Susquehanna River.

Nos. 4, 5, and 6. Drawings of a railway car.

No. 7. Drawing of an engine.

Map of the Railways in the United States.

PLAN



ELEVATION

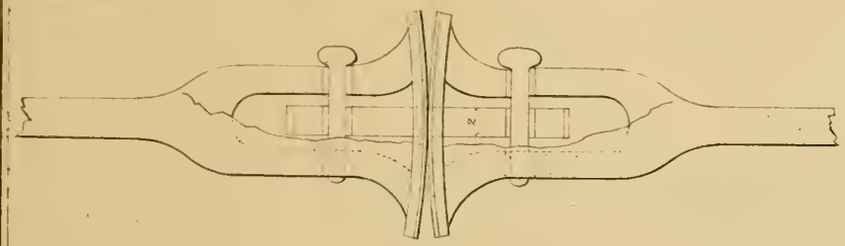
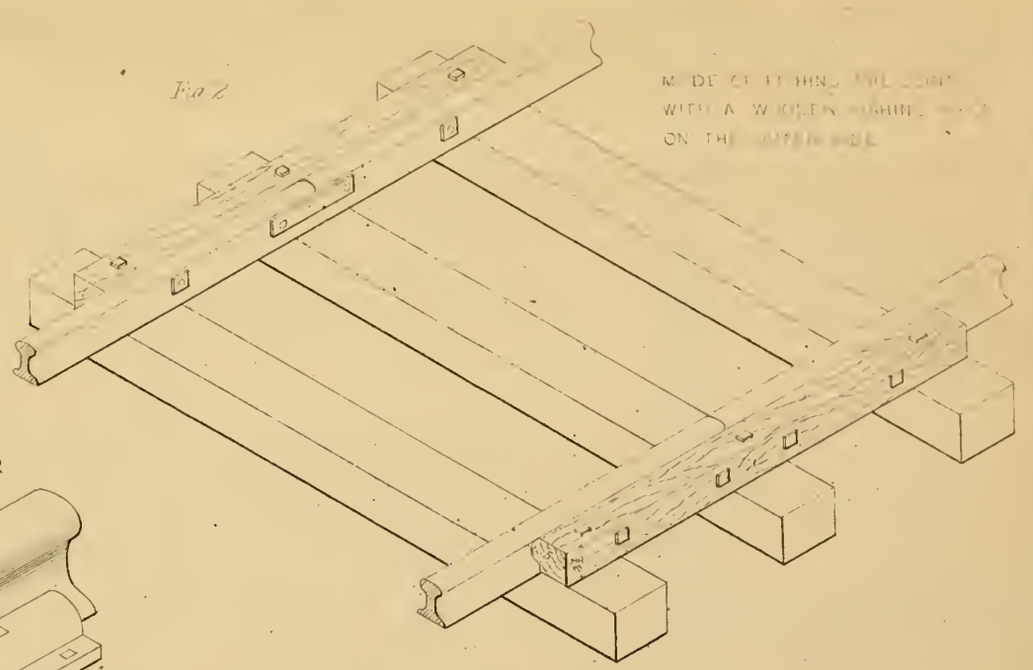


Fig 2



LONG JOINT CHAIR
OF WROUGHT IRON

Fig 3.

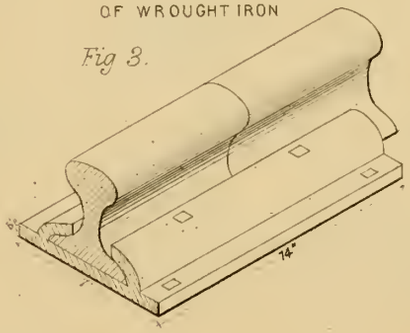
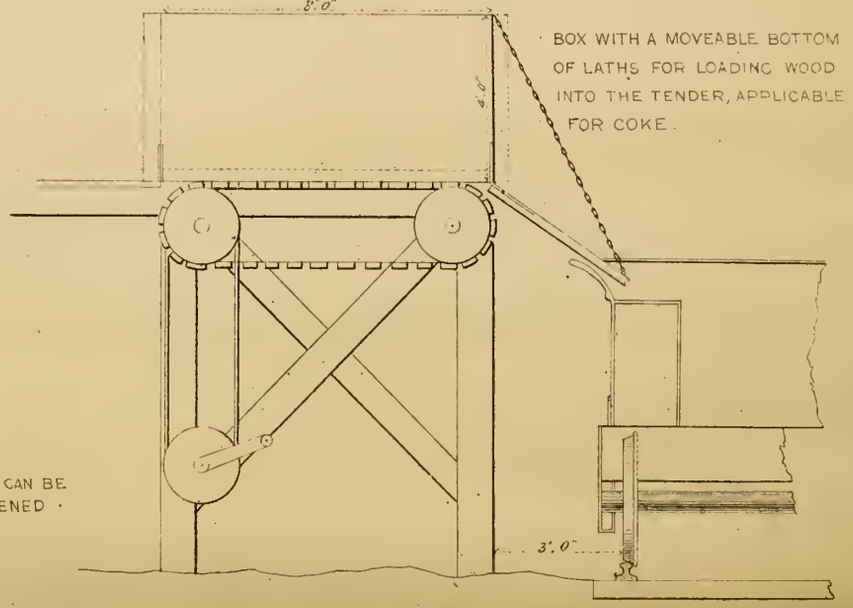


Fig 4.



BOX WITH A MOVEABLE BOTTOM OF LATHS FOR LOADING WOOD INTO THE TENDER, APPLICABLE FOR COKE.

LONGITUDINAL SECTION OF ENGINE
FOR BURNING ANTHRACITE COAL AND TO WORK UP INCLINES

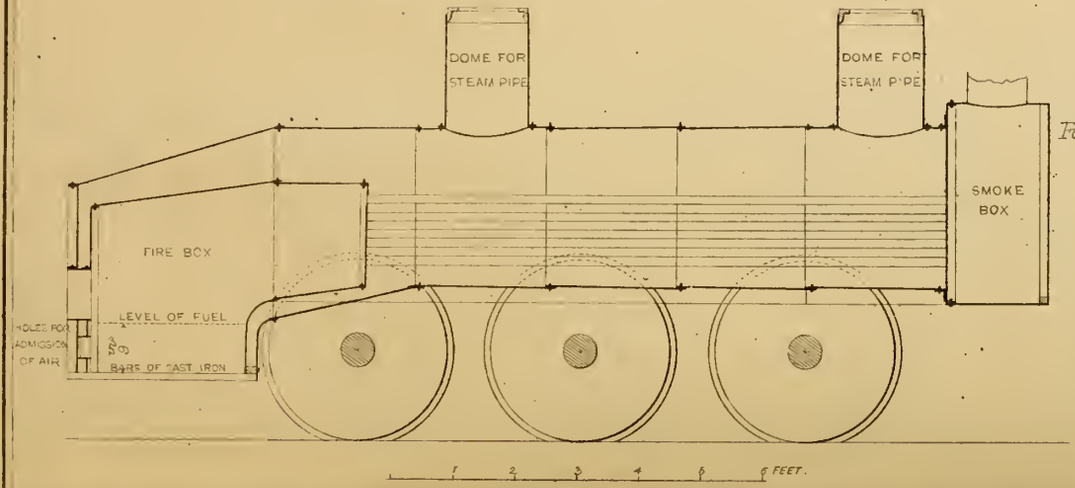
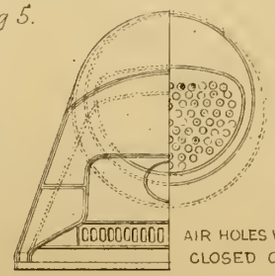


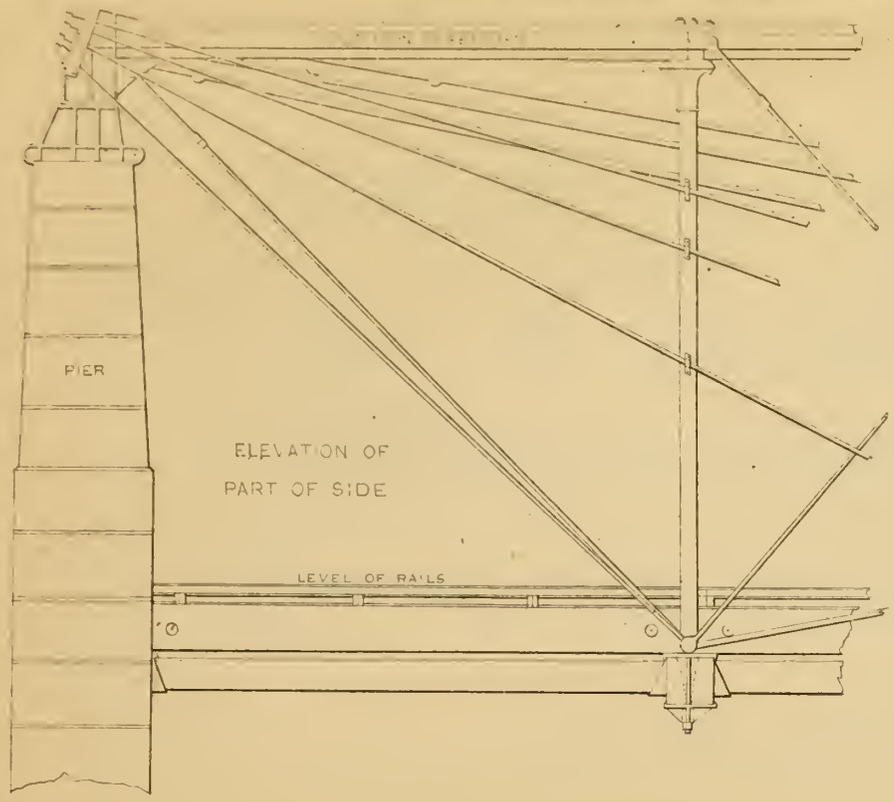
Fig 5.

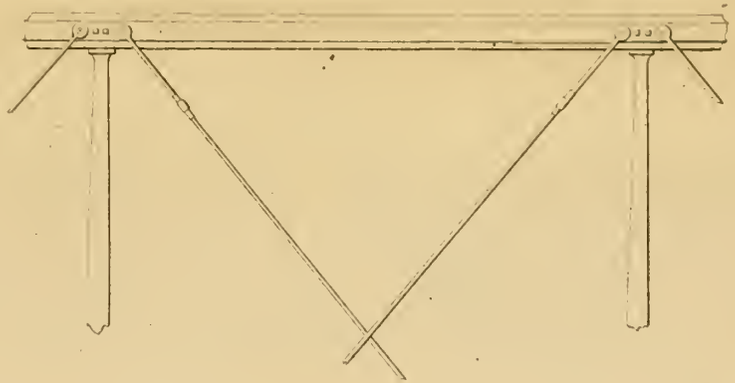
HALF END ELEVATION
AND TRANSVERSE SECTION
OF FIRE BOX



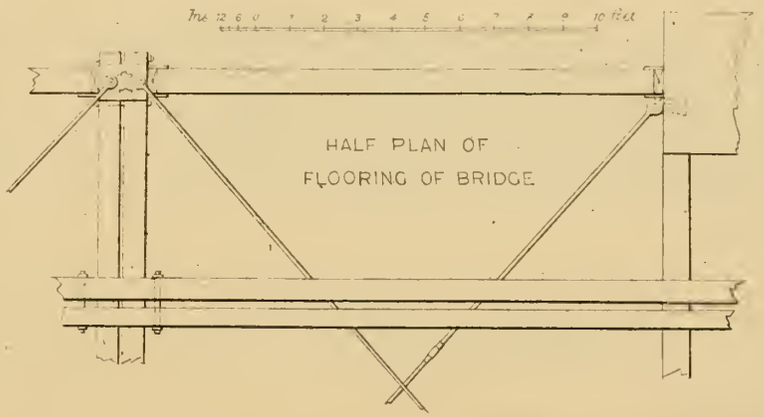
AIR HOLES WHICH CAN BE CLOSED OR OPENED

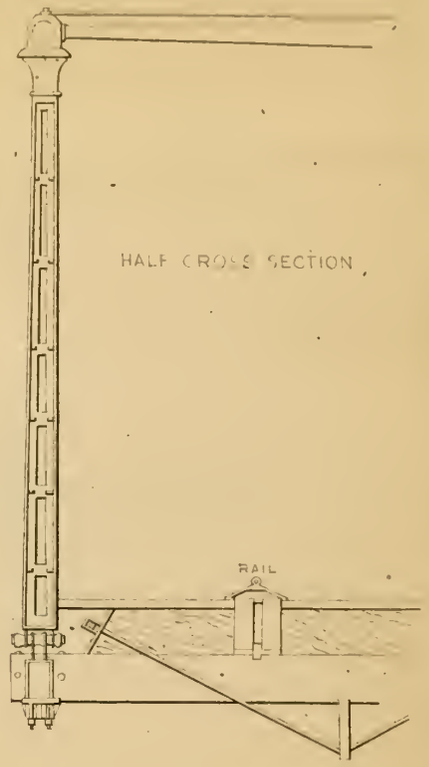
[illegible] Cross and Suspension Bridge by W. Ballman at Harper's Ferry on Baltimore and Ohio Railway

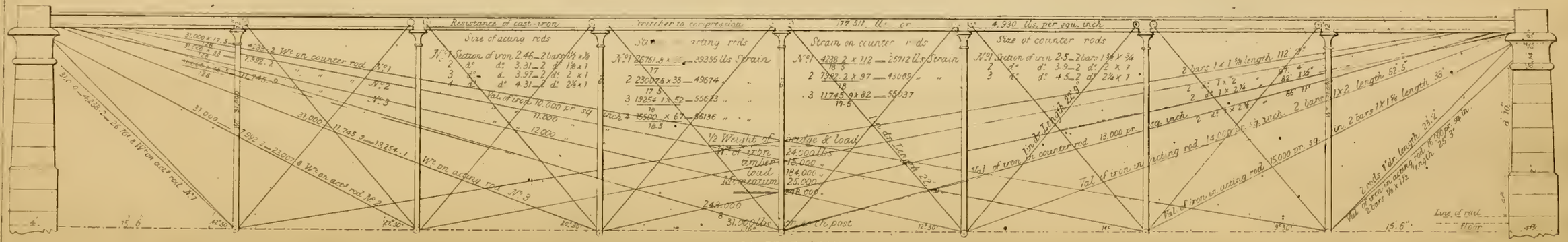




SCALE

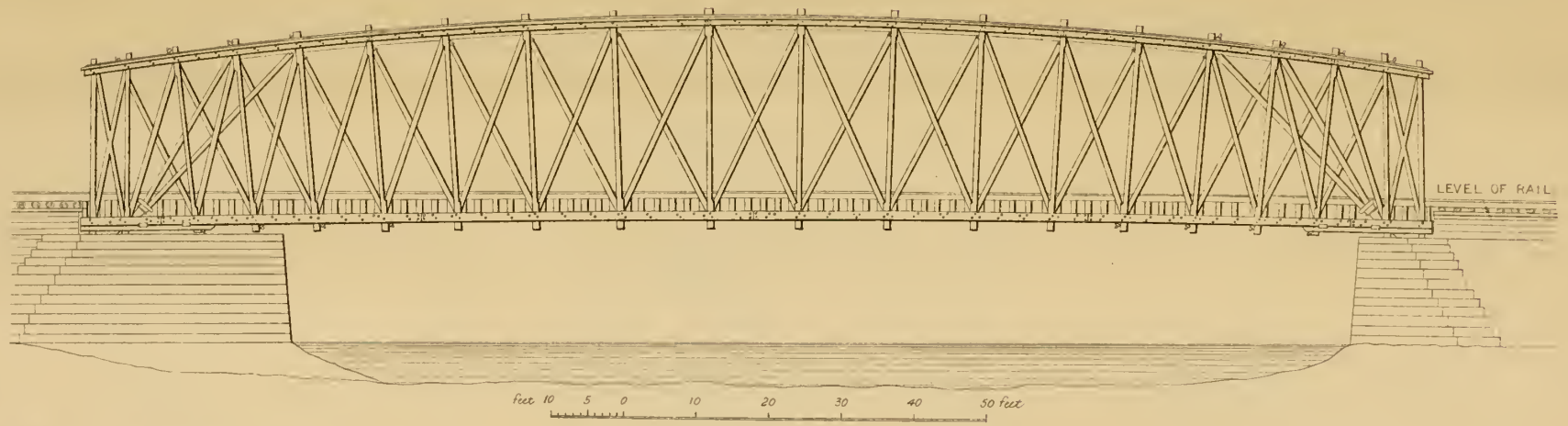




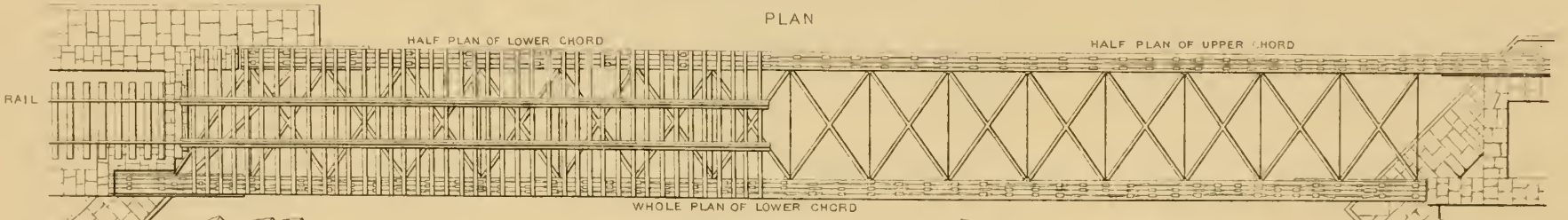

Resistance of cast-iron
Stretcher to compression
137 511 lbs on
4,930 lbs per sq. inch
Size of acting rods
Strain on counter rods
Size of counter rods
No 1 Section of iron 2.46 — 2 bars 1½ x ⅞
No 1 Section of iron 2.5 — 2 bars 1⅝ x ¾
No 1 4238.2 x 112 — 25712 lbs Strain
No 1 26761.8 x — 29355 lbs Strain
2 7892.2 x 97 — 43009 " "
2 230078 x 38 — 49674 " "
3 11745.9 x 82 — 55637
3 19254.1 x 52 — 55623 " "
inch 7 15500 x 67 — 56136 " "
Val. of iron 10.000 pr sq
11.000 "
12.000 "
½ Weight of
W.t of train
timber
load.
Momentum
24.000 lbs
15.000 "
184.000 "
25.000 "
248.000
31.000 lbs
W.t on counter rod No 1
W.t on acting rod No 2
W.t on acting rod No 3
W.t on axle rod No 1
Val of iron in counter rod 13.000 pr.
Val of iron in acting rod 14.000 pr. sq. inch
Val of iron in acting rod 15.000 pr. sq
2 bars 1 x 1⅝ length 112"
2 bars 1 x 1⅝ length 52.5"
2 bars 1 x 1⅝ length 38"
2 rods 1⅛ length 23.3"
Val of iron in acting rod 16.500 pr. sq in
2 bars ⅞ x 1⅛ length 23.3"
Line of rail
15.6"
124 FEET SPAN

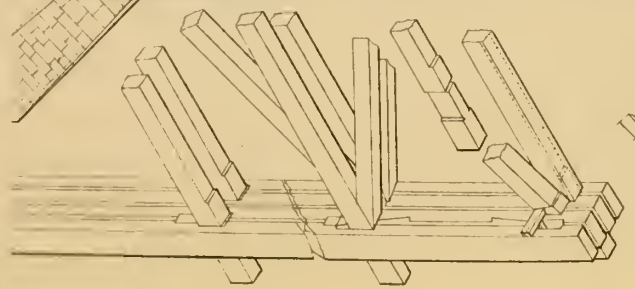
TIMBER BRIDGE OF 190 FEET SPAN OVER THE SUSQUEHANNA ERECTED ON THE NEW YORK & ERIE RAILWAY.

ELEVATION



PLAN



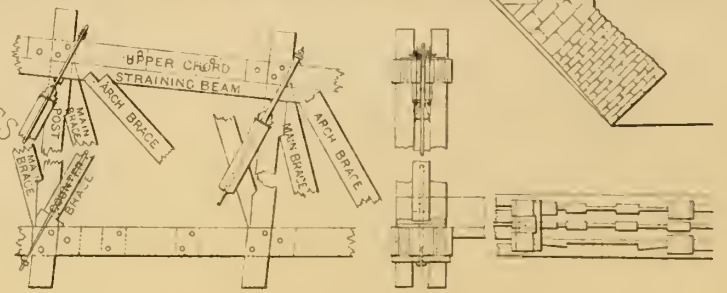


INFLEXIBLE ARCHED TRUSS

RAIL ROAD BRIDGE.

designed by

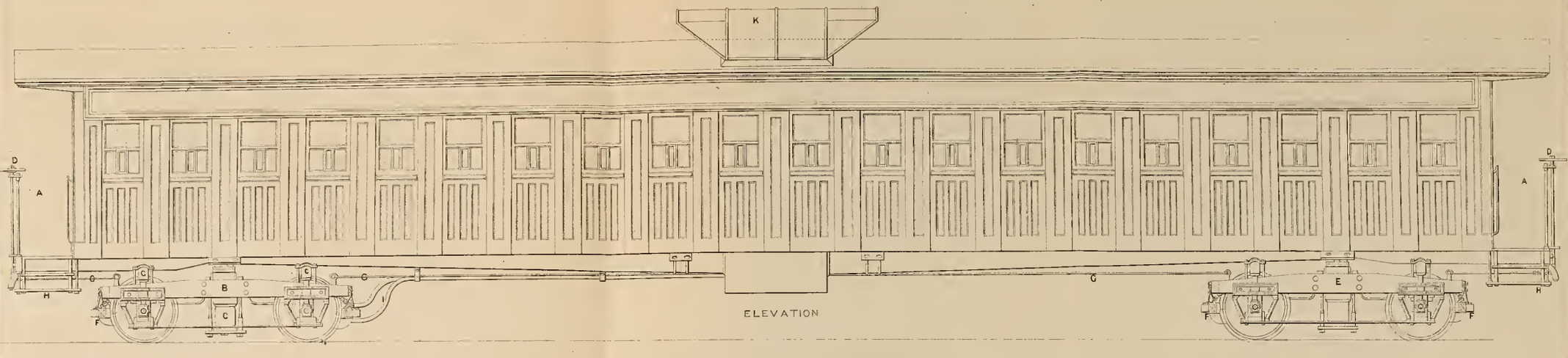
D. C. Mc CALLUM



Day & son, Lith. to the Queen.

PLATE N° 4.

PASSENGER CAR ON THE NEW YORK AND ERIE RAILWAY; FITTED WITH A VENTILATING APPARATUS.

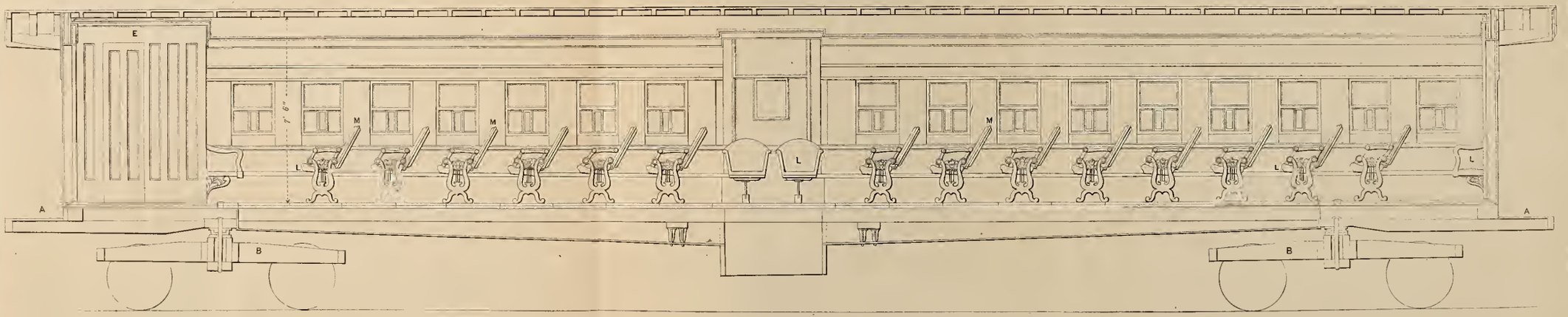


ELEVATION

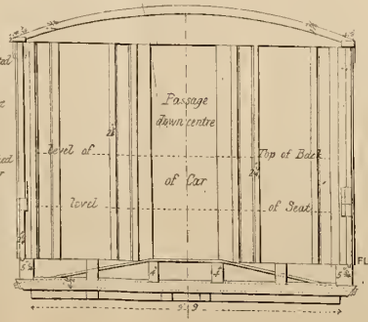
SCALE

Inches 12 9 6 3 0 1 2 3 4 5 6 7 8 9 10 Feet

LONGITUDINAL SECTION

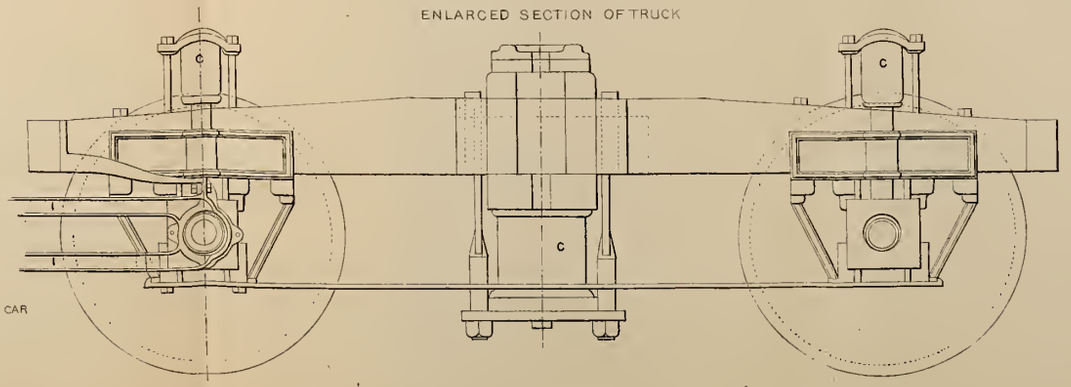


TRANSVERSE SECTION AT CENTRE OF TRUCK
SHEWING TRUSSED FRAMING



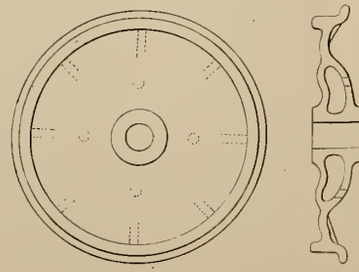
A Platform for ingress and egress to Car
B Truck upon which Body of Car is supported
C India rubber springs
D Break handle
E Compartment containing Saloon & Closet
F Breaks
G Rods from Break to Break Handle
H Steps from Platform
I Connecting pipes from pump attached to the axle conducting to air chamber
K Funnel for ventilating Apparatus
L Seats
M Back of Seat, capable of being reversed to Enable the passengers to face Either way

ENLARGED SECTION OF TRUCK



Inches 12 9 6 3 0 1 2 3 Feet

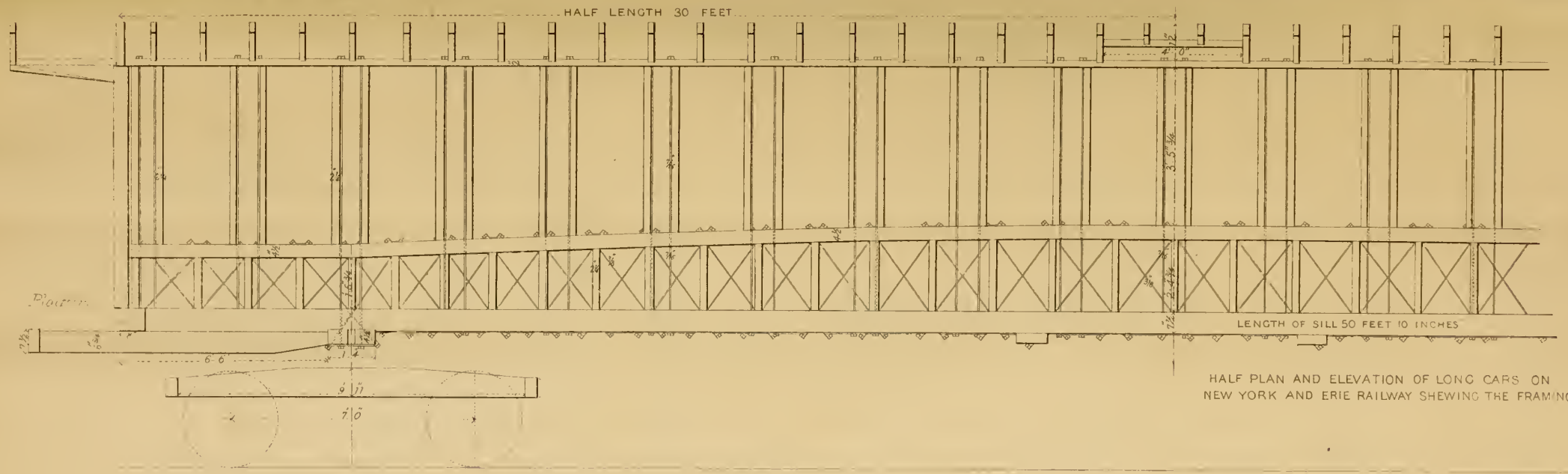
ELEVATION AND SECTION OF CAST IRON WHEEL
WITH CHILLED TIRE



Inches 12 9 6 3 0 1 2 Feet

Day & Son. Lith.rs to the Queen.

ELEVATION



HALF PLAN AND ELEVATION OF LONG CARS ON
NEW YORK AND ERIE RAILWAY SHEWING THE FRAMING

PLAN

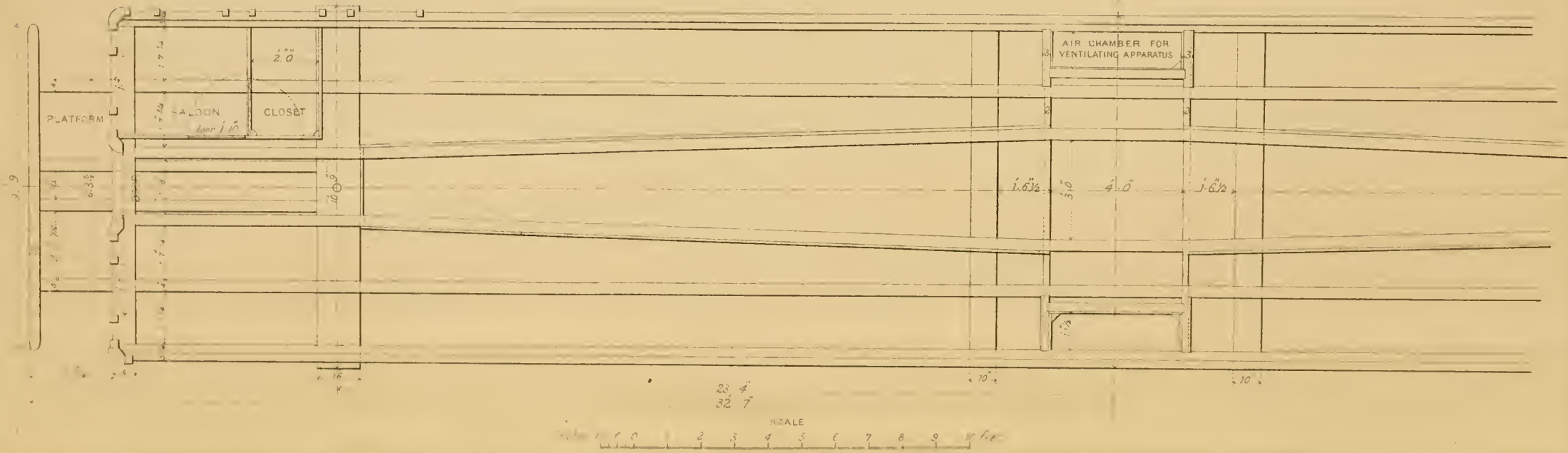
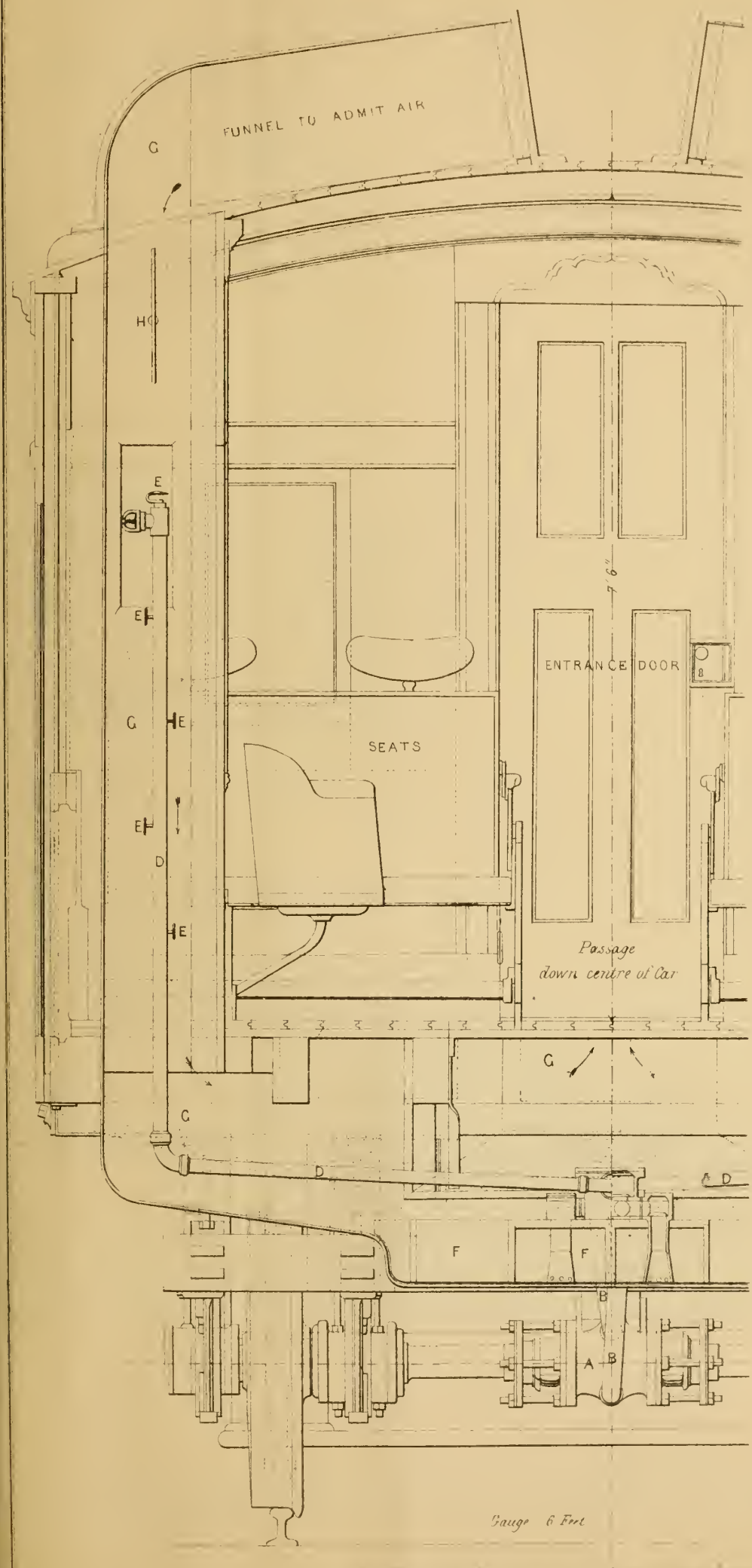
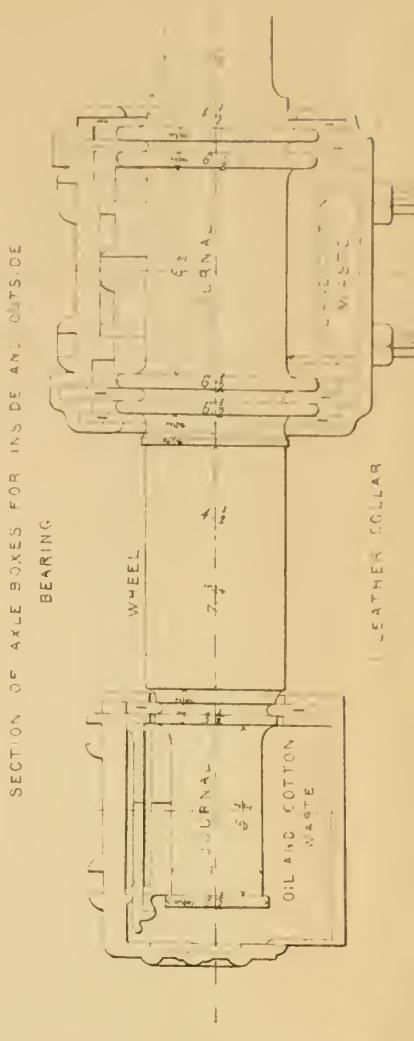


PLATE N° 6





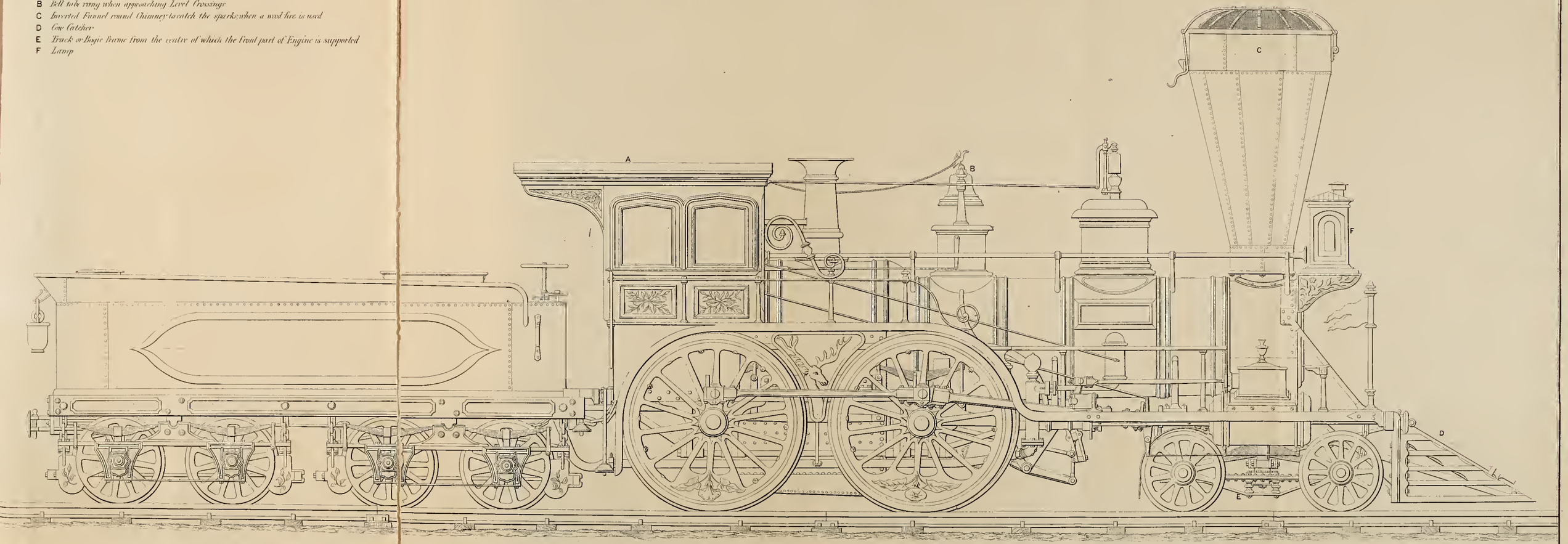
Half Section of Carriage to shew the Ventilating apparatus used on the New York & Erie Railway. The Truck is supported on inside and outside bearings.

A *Pump*
B *Connecting pipes*
C *Valves*
D *Brass pipe*
E *Sprinklers*
F *Water Tank*
G *Air Channel*
H *Air Holes*

U. S. Statutes at Large, Queen's

ELEVATION OF ENGINE AND TENDER IN GENERAL USE ON RAILWAYS IN THE UNITED STATES

A *Shed for protecting the Engine Driver and Fireman from the weather*
B *Bell to be rung when approaching Level Crossings*
C *Inverted Funnel round Chimney to catch the sparks when a wood fire is used*
D *Cow Catcher*
E *Truck or Bogie frame from the centre of which the front part of Engine is supported*
F *Lamp*



Scale
Inches 12 9 6 3 0 1 2 3 4 5 6 7 8 9 10 feet

Day & Son, Lith^r to the Queen

MAP
SHEWING THE
RAILWAYS
IN THE
UNITED STATES OF AMERICA
AND
CANADA.

To accompany Captain Galton's Report to the Lords of the Committee of Privy Council for Trade, 1856.

Drawn by F. McKenzie.

SCALE OF MILES

Day & Son Lith.rs to the Queen

LONDON:
Printed by GEORGE E. EYRE and WILLIAM SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty.
For Her Majesty's Stationery Office.

REPORT

TO THE

LORDS OF THE COMMITTEE OF PRIVY COUNCIL FOR TRADE AND FOREIGN PLANTATIONS,

ON THE

RAILWAYS OF THE UNITED STATES

BY

CAPTAIN DOUGLAS GALTON, R.E.

Presented to both Houses of Parliament by Command of Her Majesty.

LONDON:
PRINTED BY GEORGE EDWARD EYRE AND WILLIAM SPOTTISWOODE,
PRINTERS TO THE QUEEN'S MOST EXCELLENT MAJESTY
FOR HER MAJESTY'S STATIONERY OFFICE.

1857.

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Report to the Lords of the Committee of Privy Council

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